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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

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CONTENTS, PAGE 419 DIRECTORIES, PAGE 82 WANT ADS, PAGE 91 INDEX TO ADVERTISEMENTS, PAGE 103

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THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:

ELECTRO-PLATERS REVIEW

Vol. 16 NEW YORK, SEPTEMBER, 1918 No. 9

THE FOUNDRYMEN'S CONVENTION

LATEST INFORMATION REGARDING THE 1918 MEETING OF THE ALLIED METAL TRADES ASSOCIATIONS AND THE EXHIBITION OF FOUNDRY APPARATUS AND SUPPLIES TO BE HELD IN MILWAUKEE, WIS., OCTOBER 7 TO 11 INCLUSIVE.

Written for THE METAL INDUSTRY by J. V. LOEWI.

MILWAUKEE, THE CONVENTION CITY OF 1918.

Milwaukee has commanded a reputation as a convention city for many years. For this reason it has adopted the slogan "A Bright Spot," which is characteristic of the impression the visitor carries off after inspecting its extensive industrial districts with their wholesome working conditions.

Milwaukee is not a commercial city. Its growth is attributed to its manufacturing establishments.

For this reason its so-called downtown or retail and wholesale districts appear materially out of proportion to its vast manufacturing sections, which are to be found in every direction.

Milwaukee thrives on its manufacturing industries.

Nature provided that it should. Its industries are the result of a steady development. Their success is the outgrowth of natural conditions which have favored it.

J. VICTOR LOEWI.

In the first place, Milwaukee is particularly adapted to be a metal center because of its central location with relation to raw material resources. Its advantageous situation on the finest harbor on the Great Lakes gave it cheap transportation facilities. The topography of the land on which Milwaukee sprung out, endows it is a manufacturing center.

It has three principal disadvantages which are by far outweighed by the natural advantages. They are its nearness to Chicago (eighty-five miles distant), Socialism and conservatism.

Milwaukee stands at the fork, on the main road of the country's mineral resources. Its nearness to the Michigan copper region insures an ore supply at a minimum shipping cost. Nearly all copper ore received here comes down Lake Michigan on large, specially designed ore-carrying craft. The Wisconsin lead, zinc and graphite mines are less than one hundred miles

A BIRDSEYE VIEW OF THE EAST SIDE DOWNTOWN SECTION OR OLD PART OF MILWAUKEE, WIS.

to the southwest. This mining region has for years furnished high grade ore and has not yet approached the apex in its development.

Iron ore comes down through Lakes Superior and

A FRONT VIEW OF HARLEY-DAVIDSON PLANT NO. 1. HERE LARGE QUANTITIES OF ALUMINUM, BRASS AND TIN ARE USED.

Michigan from the Minnesota and Wisconsin iron belt. Manganese is also mined in this district.

The city's bituminous coal supply comes from its neighboring states, Illinois and Indiana. Anthracite is shipped from Pennsylvania by boat at a reasonable cost.

The many advantages of Milwaukee's position on the lakes have manifested themselves since this country's entry into the war. When the rail congestion tied up

THE NATIONAL ENAMELING AND STAMPING COMPANY'S MILWAUKEE WORKS. THIS COMPANY CLAIMS TO BE THE PREMIER TINWARE AND ENAMELING PRODUCING COMPANY IN THE WORLD. THE AMOUNT OF TIN AND OTHER METALS NECESSARY TO MAKE ITS PRODUCTS IS ENORMOUS.

the hard coal supply of neighboring states, Wisconsin obtained its fuel via boat, and famine was averted. Practically the city's entire coal supply has already arrived for next winter by this means of transportation.

The city is built up along three navigable rivers. Boats ply up these streams for several miles and unload their cargoes at the doors of the manufacturing establishments.

The principal industrial district located in the Menomonee river valley is served by two railroads, the river and a network of canals.

The manufacturing areas have now been extended to the outskirts, where taxes are cheap, yet where all the advantages of the city are retained.

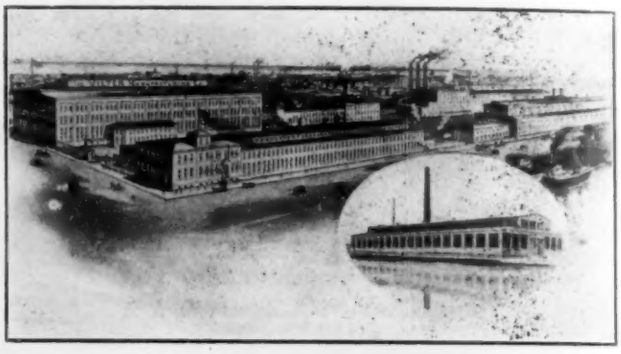
These suburbs are now the homes of the largest industries. The Allis Chalmers Manufacturing Company—the largest located in Milwaukee—has its main plant here.

Milwaukee is the seat of 219 metal producing or working plants.

Iron and steel, naturally is the principal product of these. Brass copper and aluminum have an important place in the output of the majority of the plants, particularly the larger ones.

Sixteen of the city's greatest industrial concerns operate large brass foundries. At least five of these refine aluminum.

There are no exclusively aluminum foundries of any importance located within the city. The Worra Aluminum Foundry at Waukesha—fifteen miles away—is the largest in the vicinity.



BIRDSEYE VIEW OF THE VILTER MANUFACTURING COMPANY'S PLANTS. THE VILTER COMPANY MANUFACTURES CORLISS ENGINES AND REFRIGERATING MACHINERY. IT HAS A LARGE BRASS FOUNDRY.

Milwaukee industries engaged in the production of various metals number ninety-seven. They employ close to forty thousand men.

In 1917 the aggregate value of the products of these plants reached almost $108,000,000. This figure will be surmounted by at least twenty-five per cent in 1918, according to every indication. There is hardly a concern which has not added extensively to its plant capacity and which is not at the present time adding.

The capital employed in these factories approaches $70,000,000.

These figures do not take into consideration the production of malleable iron, castings, structural steel, railroad equipment, furnaces and stoves, trucks, auto accessories, motorcycles and steel ships. The industries just named add $72,000,000 to the value of the city's products and $36,000,000 to the capital employed.

The largest manufacturing plants here using appreciable quantities of brass, aluminum and copper as classified by W. J. Fairbairn, secretary of the Milwaukee Metal Trades and Founders' Bureau are:

The Allis Chalmers Manufacturing Company, mining and pumping machinery.
The A. O. Smith Company, auto parts, motor wheels.
The Bucyrus Company, dredges, excavating machinery.
The Chain Belt Company, cement mixers.
The Cutler-Hammer Manufacturing Company, electrical equipment.
The Evinrude Motor Company, detachable rowboat motors.
The Falk Company, castings, electric switches.
Gueder, Paeschke and Frey, tinware, enamelware.

The Harley-Davidson Motor Company, motorcycles, sidecars.
The International Harvester Company, agricultural equipment.
The National Brake & Electric Company, air brakes, four-wheel drive tractors, gasoline locomotives.
The Nordberg Manufacturing Company, engines, hoisting machinery, air compressors.
The National Enameling & Stamping Company, tinware, enamelware, stampings.
Pawling & Harnischfeger, travelling cranes.
The Vilter Manufacturing Company, Corliss engines, refrigerator machinery.
The Wisconsin Motor Company, truck, auto and aeroplane motors.

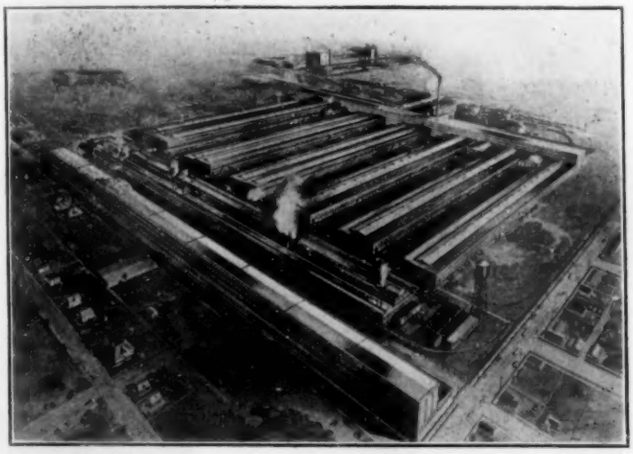
Since the outbreak of war in 1914, the Allis Chalmers company emerged from a state of insolvency into a thriving concern, with more orders than it could handle. The war came at an opportune time, for it precluded the need of new financing.

The total daily melting capacity of this company's foundry is 400 tons. The foundries alone require 800 men.

Before the war the plant at West Allis was the only one in operation. Today the company utilizes its old Reliance plant, located in another section of the city.

The two plants employ a total of 8,283 men. The West Allis works have lately been improved by the addition of many new buildings.

The Reliance plant housed the original company. It had lain dormant for years preceding the war. It has since been rehabilitated, and now every bit of its floor



PLANTS OF ALLIS-CHALMERS COMPANY AT MILWAUKEE, WIS., HERE ARE USED LARGE AMOUNTS OF BRASS AND ALUMINUM IN THE MANUFACTURE OF MINING MACHINERY.

space is in use. Two thousand two hundred and thirty-three men are employed in that works alone.

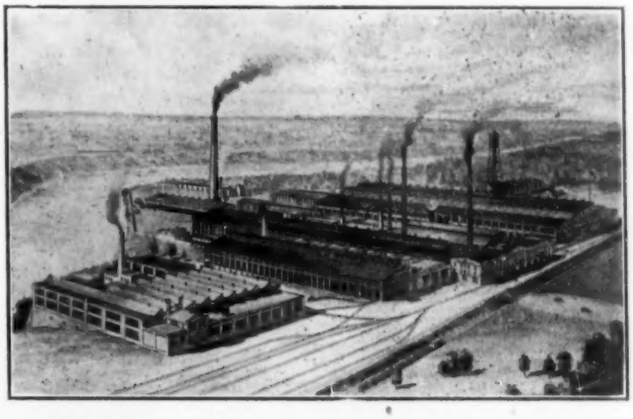
In peace times the Allis Chalmers Company makes mining machinery, pumps and the like. Today it manufactures many varieties of war material—principally shells.

It has 2,217,448 square feet in its West Allis plant alone to devote to this work. The foundry measures 999 feet in length and has a floor area of 227,096 square feet.

The Harley Davidson Motor Company is one of the largest users of aluminum and brass among Milwaukee's many industries. The company's product is the internationally reputed Harley-Davidson motorcycle. The motorcycles have been used in large numbers by the British army fighting in Western France. They had distinguished themselves for flexibility and durability long before the United States became a belligerent nation.

The Harley-Davidson has recently expanded its business to such an extent that one large plant proved inadequate. A large factory was subsequently erected on the south side, miles away from its main plant, to house its automatic machinery. The principal works, located on the West Side, boasts of a floor area totalling 300,000 square feet. Over 1,600 men are emppoyed at both plants.

The company operates 105 automatic machines, 155



THE NATIONAL AIRBRAKE AND ELECTRIC COMPANY'S FACTORY, INCLUDING ITS BRASS FOUNDRY. THIS CONCERN USES CONSIDERABLE BRASS AND ALUMINUM. IT IS ENGAGED IN GOVERNMENT WORK AT PRESENT.

grinders, 146 engine lathes, and 235 drill presses—a total of 1,116 machines.

The National Airbrake and Electric Company turns out large quantities of brass for use in the manufacture of its air brakes for electric railway cars, its four-wheel drive tractors and pumps. It employs approximately 1,500 men.

Motors for the government now occupy the entire production capacity of the Wisconsin Motor Company. Since the United States became involved in the war the plant has grown from comparative insignificance to a large industry. It employs 1,600 men on the average.

Its products are four- and six-cylinder truck motors and six- and eight-cylinder aeroplane motors.

At its Milwaukee plant, the National Enameling and Stamping Company turns out tinware. The company claims to be the largest tinware producer in the world. Approximately 1,000 men are employed in this capacity.

Gueder, Paeschke & Frey are engaged in the same business, also on a large scale.

The Power Mining and Machinery Company, a subsidary of the Worthington Pump Company, is working exclusively on marine engines for government use in connection with its shipping program. The company has frequently been hindered in carrying out its contract by labor disturbances. Over 800 of its 1,200 employes recently struck for four days temporarily tying up production.

The A. O. Smith Company is devoted to the manufacture of automobile parts, and as a side line Smith motor wheels. It operates a large brass foundry.

The Bucyrus Company makes dredging and digging machinery. Its excavating machinery helped materially in completing the Panama Canal. The plant is constantly expanding.

Up to a short time ago the Evinrude Motor Company manufactured detachable rowboat motors. It has since turned its large plant into one for the production of war material entirely.

Sterling trucks are manufactured at Milwaukee by the Sterling Motor Truck Company.

The Cutler-Hammer Manufacturing Company is one of the largest producers of electrical devices in the world. It makes electrical gear shifts, submarine apparatus and switchboards. About 2,500 men are engaged in this work.

Corliss engines, refrigerating machinery, poppet valve engines and other equipment are produced by the Vilter Manufacturing Company, which employs over 2,000 workers.

Visitors coming here from all parts of the country to

A VIEW OF THE WEST SIDE OR NEWER PART OF THE BUSINESS SECTION OF MILWAUKEE.

attend the Allied Metal Trades Congress will be given an opportunity to inspect these many plants in addition to the exhibits.

Milwaukee's industries have expanded slowly but surely year by year. Natural conditions have favored their growth. Man-made conditions are retarding it.

Socialism has contributed more to the disruption of industry here than any one factor. Although living is cheap and working conditions excellent, trouble is continually fomented to the city's disadvantage.

The government recently revoked a shipbuilding contract because labor—led on by trouble-seeking leaders—deliberately refused to respond with their best efforts. When this menace is eliminated it is generally conceded industry will have a clear track ahead.

THE CONVENTION OF FOUNDRY MEN.

At Milwaukee, during the week of October 7, will be held the greatest gathering of metal manufacturers ever assembled in this or any other country. Simultaneous meetings will be held by the American Foundrymen's Association, Iron and Steel section of the American Institute of Mining Engineers, Institute of Metals division of the American Institute of Mining Engineers, and American Malleable Castings Association. Concurrent with these meetings will be conducted an exhibition of all kinds of labor-saving metal working equipment. Every branch of the metal industries will be represented, including the gray iron, steel, malleable iron and brass foundry trade; iron and steel industry, from the mining of the ore to the production of pig iron, its conversion into steel and finally the rolled product and the brass and copper mill rolling industry.

The keynote of many of the addresses and papers that will be presented, will be the acceleration of production for the prosecution and winning of the war. In fact, the purpose underlying the holding of this great meeting is to afford manufacturers of ordnance and other war equipment an opportunity for an interchange of ideas regarding methods of production and operation.

The great interest that is being manifested in this event is reflected by the large number of reservations for space in the Milwaukee Auditorium, where the exhibition will be held. Already 165 manufacturers have decided to make displays and only a comparatively small amount of space is still available. The indications are that this will be the largest show of its kind ever held in this country.

The manufacturers of Milwaukee already have organized committees on arrangements for the entertainment and reception of the visitors who will number from 3,500 to 4,000. The program, although not definitely outlined, will include a reception and dance at the Milwaukee Auditorium, theater party and boat ride. In addition the visiting ladies will be taken on an automobile sightseeing tour and will be tendered several luncheons. Plant visitation probably will be confined to Thursday and Friday and many notable works in the Milwaukee district will be open for inspection. On Thursday evening, October 10, the banquet will be held and addresses will be delivered by speakers of international fame. The Milwaukee committees on arrangements are constituted as follows:

GENERAL COMMITTEE

Theo. O. Vilter, chairman, president, Vilter Mfg. Co.; W. J. Fairbairn, secretary, Milwaukee Metal Trades and Founders' Association; A. Harrison, superintendent foundry and pattern shop, Allis-Chalmers Mfg. Co.; E. Bearman, Illinois Steel Co.; John D. Bird, general manager, Power & Mining Machinery Co., Cudahy, Wis.; James Marshall, general manager, Geo. H. Smith Steel Castings Co.; W. G. Bruce, secretary, Milwaukee Association of Commerce; Henry Weber, chairman, Milwaukee Park Board; Geo. Kuemmerlein, superintendent of transportation, Milwaukee Electric Railway & Light Co.; A. E. Copeland, manager, Hotel Wisconsin; W. P. O'Connor, general agent, Goodrich Transportation Co.; F. C. Reynolds, general agent, Pere Marquette Railroad, and Jos. C. Grieb, manager, Milwaukee Auditorium.

FINANCE COMMITTEE

Theo. O. Vilter, chairman, Vilter Mfg. Co.; W. G. Bruce, Milwaukee Association of Commerce; C. R. Messinger, Chain Belt

LAKE FRONT AT MILWAUKEE, WIS., SHOWING BREAKWATER AND GOVERNMENT PIER.

Co.; J. D. Bird, Power & Mining Machinery Co., Cudahy, Wis.; T. A. Glasscott, Pickands, Brown & Co.; John Thomas, Thomas Furnace Co.; A. J. Lindeman, Lindeman & Hoverson Co.; Otto H. Falk, Allis-Chalmers Mfg. Co. and Walter Kasten, treasurer, finance committee, Wisconsin National Bank.

ENTERTAINMENT COMMITTEE

Geo. Kuemmerlein, chairman, Milwaukee Electric Railway & Light Co.; Henry Weber, Milwaukee Park Board; J. J. McDevitt, S. Obermayer Co.; John Mertes, Federal Foundry Supply Co.; C. E. Lemmon, chemist; T. A. Glasscott, Pickands, Brown & Co.; James Marshall, Geo. H. Smith Steel Castings Co.; F. C. Reynolds, Pere Marquette Railroad, and J. S. Pinson, Avery Co.

GOLF COMMITTEE

J. D. Bird, chairman, Power & Mining Machinery Co., Cudahy, Wis.; C. R. Messinger, Chain Belt Co.; David McLain, McLain's System; F. E. Layman, chemist, and C. G. Ocock, Avery Co.

RECEPTION COMMITTEE

E. Bearman, chairman, Illinois Steel Co.; Frank Cleveland, Milwaukee Association of Commerce; David McLain, McLain's System; J. D. Shaw, Shaw Foundry Co.; E. A. Wurcester, Falk Co.; J. A. McDevitt, S. Obermayer Co.; Henry R. Donald, Essley Machinery Co.; T. A. Glasscott, Pickands, Brown & Co.; O. B. Pupikofer, American Gum Products Co.; W. J. Fairbairn, Milwaukee Metal Trades & Founders' Association; Roy Smith, Hotel Pfister; A. E. Copeland, Hotel Wisconsin; Henry Wehr, Wehr Steel Castings Co.; Herman Kletzsch, Republican House; W. W. Sommers, Hotel Carlton; W. M. Nefzger, Hotel Schlitz; S. Duffy, Hotel Plankinton, and F. B. Sweeney, Hotel Maryland.

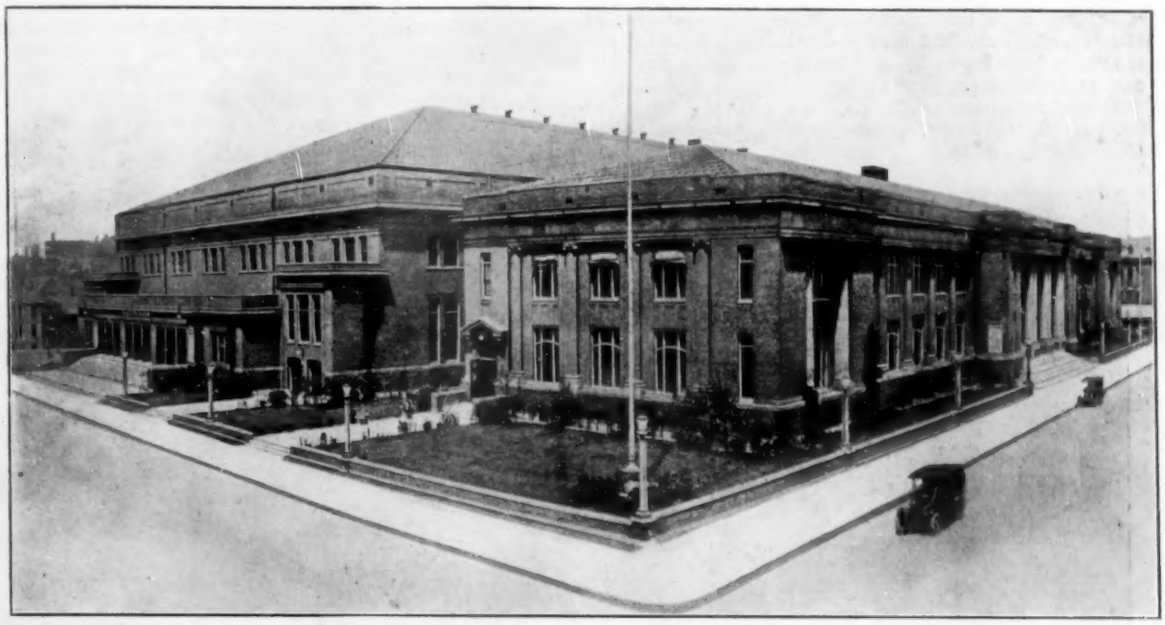
PLANT VISITATION COMMITTEE

A. Harrison, chairman, Allis-Chalmers Mfg. Co.; James Marshall, Geo. H. Smith Steel Casting Co.; H. R. Donald, Essley Machinery Co.; Wells K. Gregg and H. G. Siefert.

Iron and Steel section, and the Institute of Metals division of the American Institute of Mining Engineers will be called to order in separate halls in the Milwaukee Auditorium, where the activities of the week will be centered.

The exhibition will be opened formally on Monday afternoon, October 7. Beginning Tuesday, October 8, the American Foundrymen's Association will hold daily meetings in the morning only, and on several days simultaneous sessions will be necessary to dispose of the lengthy program in time for adjournment Friday noon, October 11. The Institute of Metals division of the American Institute of Mining Engineers will have one meeting on Tuesday, two on Wednesday, and one on Thursday. The Iron and Steel Section of the American Institute of Mining Engineers will hold three meetings and will adjourn Wednesday afternoon. Only one meeting is scheduled by the American Malleable Castings Association.

One of the notable features of these meetings will be



THE AUDITORIUM AT MILWAUKEE, WISCONSIN, WHERE THE ANNUAL CONVENTION OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION AND THE AMERICAN INSTITUTE OF METALS, TOGETHER WITH THE CONCURRENT EXHIBITION OF FOUNDRY SUPPLIES AND EQUIPMENT, MACHINE TOOL AND ACCESSORIES, HELD UNDER THE AUSPICES OF THESE TWO ORGANIZATIONS, WILL BE HELD OCTOBER 7-12, 1918.

BANQUET COMMITTEE

W. P. O'Connor, chairman, Goodrich Transportation Co.; A. E. Copeland, Hotel Wisconsin and H. Weber, Milwaukee Park Board.

THEATRE, AUTOMOBILE AND BOAT EXCURSION COMMITTEE

James Marshall, chairman, Geo. H. Smith Steel Casting Co., and J. C. McDevitt, S. Obermayer Co.

LADIES' COMMITTEE

A. E. Copeland, chairman, Hotel Wisconsin; F. C. Reynolds, Pere Marquette Railroad; Henry Weber, Milwaukee Park Board, and O. B. Pupikofer, American Gum Products Co.

MEETINGS AND EXHIBITION.

The meetings of the Allied Metal Trades Association will be opened on Tuesday morning, October 8, with a joint session at which the address of welcome will be delivered by Emanuel L. Phillip, Governor of Wisconsin. This will be followed by addresses relating to the importance of the metal working industry in the prosecution of the war by speakers of note who are familiar with the activities at Washington. Upon adjournment, the opening session of the American Foundrymen's Association, the large number of interesting moving pictures that will be shown. These will include the use and manufacture of hand grenades; the civil re-establishment of wounded and crippled Canadian soldiers; the manufacture and launching of ships at the Hog Island yard, Philadelphia; the building of concrete ships; the manufacture of steel by the triplex process, and the cause and prevention of industrial accidents.

INSTITUTE OF METALS DIVISION.

The program of the Institute of Metals division of the American Institute of Mining Engineers is replete with practical topics of interest to the brass foundryman. One feature of this gathering will be the discussion of the conservation of tin and representatives of various industries uusing tin in manufacture will contribute to this symposium.

TUESDAY MORNING, OCTOBER 8

The Metallography of Tungsten. By Zay Jeffries. (Bulletin No. 138, p. 1037.)

The Constitution of the Tin Bronzes. By S. L. Hoyt.

Paper, title not given. By C. H. Mathewson.

Notes on Babbitt and Babbitted Bearings. By Jesse L. Jones. (Bulletin No. 140, p. 1397.)

Oxygen and Sulphur in the Melting of Copper Cathodes. By S. Skowronski. (Bulletin No. 135, p. 645.)

The Relation of Sulphur to the Overpoling of Copper. By S. Skowronski. (Bulletin No. 135, p. 651); with discussion by Philip L. Gill. (Bulletin No. 140, p. 1156.)

WEDNESDAY MORNING, OCTOBER 9

Symposium on the conservation of tin. Those taking part will be the following:

Dr. G. W. Thompson, of National Lead Co.
Mr. G. H. Clamer, of the Ajax Metal Co.
Mr. C. M. Waring, Pennsylvania Railroad Co.
Mr. M. L. Lissberger, of Mark Lissberger & Son, Inc.
Mr. D. M. Buck, American Sheet & Tin Plate Co.
Mr. W. M. Corse, Titanium Bronze Co.
Messrs. Burgess and Woodward, U. S. Bureau of Standards.
Mr. M. L. Dizer, of War Industries Board.
A representative of the Niles-Bement-Pond Co.
A representative of the Bureau of Steam Engineering, U. S. Navy Dept.

WEDNESDAY AFTERNOON, OCTOBER 9

The Volatility of the Constituents of Brass. By John Johnston. (See Journal, Am. Inst. Metals, March, 1918, p. 15.)

Notes on the Metallography of Aluminum. By P. D. Merica and J. R. Freeman, Jr.

The Effect of Impurities on the Hardness of Cast Zinc or Spelter. By G. C. Stone. (See Journal, Am. Inst. Metals, March, 1918, p. 11.)

Dental Alloys. By Arthur W. Gray.

Electrolytic Zinc. By C. A. Hansen. (Bulletin No. 135, p. 615.)

The Condensation of Zinc from Its Vapor. By C. H. Fulton. (Bulletin No. 140, p. 1375.)

THURSDAY MORNING, OCTOBER 10

Notes on Non-metallic Inclusions in Bronzes and Brasses. By G. F. Comstock. (See Journal, Am. Inst. Metals, March, 1918, p. 5.)

Nichrome Castings. By Arlington Benzol, of Driver-Harris Wire Co.

Fusible Plug Manufacture. By Messrs. G. K. Burgess and L. J. Gurevich.

Paper, title not stated. By P. D. McKinney.

Application of the Spectroscope to the Chemical Determination of Lead in Copper. By Messrs. Hill and Lucke.

Radium. By Richard B. Moore. (Bulletin No. 140, p. 1165.)

THE EXHIBITION.

The exhibition of all kinds of labor saving equipment to be held in the Milwaukee Auditorium, both in size and number of individual exhibits, probably eclipses anything of its kind ever held. Machinery hall will be verted into a foundry and machine shop since practically all of the equipment to be displayed in this section of the auditorium will be operated. Many new devices will be shown which have been designed and built to facilitate the production of materials for the winning of the war.

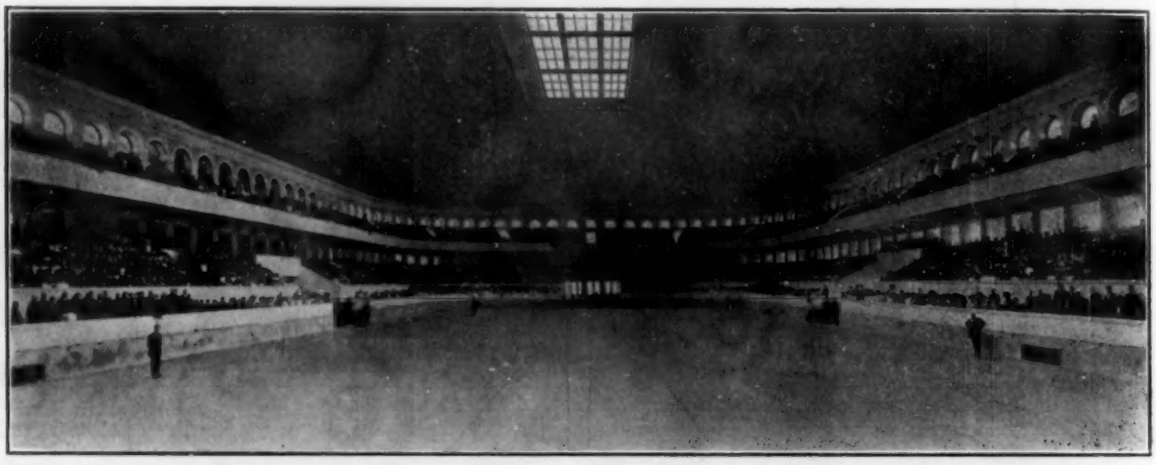
The Milwaukee Auditorium, in which the convention will be held is particularly suited for such a purpose. The Auditorium was built primarily to attract large national meets to Milwaukee.

It is designed to house the largest conventions. At times several exhibits and meetings are held under its roof simultaneously without interference to each other.

The Allied Metal Trades Congress will be the first convention to require the entire floor space of the Auditorium. With its recent addition this area now totals 80,000 square feet. The arena alone has a floor area totalling 22,500 square feet.

The seating capacity of the building including the arena and five smaller halls is 15,700 persons. The arena comfortably seats 10,000 persons. The architecture of the main hall is such that there is not a pillar or post to obstruct the view in the entire seating radius. The exhibition booths will occupy the arena and machinery hall.

Milwaukee considers itself singularly fortunate at having landed the important metal men's gathering to add to the long list of conventions already to its credit.



VIEW OF THE ARENA, WHICH COVERS 22,500 SQUARE FEET OF FLOOR SPACE, AND HAS A SEATING CAPACITY OF 10,000 PERSONS. THE FOUNDRYMEN'S CONVENTION WILL OCCUPY THE ENTIRE ARENA AS WELL AS MACHINERY HALL. THIS WILL BE THE FIRST TIME IN THE HISTORY OF THE AUDITORIUM THAT ONE CONVENTION HAS REQUIRED SO MUCH EXHIBITION SPACE (80,000 SQUARE FEET IN ALL).

The list of exhibitors is as follows:

THE EXHIBITORS.

Abell-Howe Co., Chicago.
Abrasive Co., Philadelphia.
Acme Machine Tool Co., Cincinnati, O.
Allis-Chalmers Mfg. Co., Milwaukee.
American Gum Products Co., New York.
American Foundry Equipment Co., Cleveland.
American Kron Scale Co., New York.
American Molding Machine Co., Terre Haute, Ind.
E. C. Atkins & Co., Indianapolis.
Arcade Mfg. Co., Freeport, Ill.
Asbury Graphite Mills, Asbury, N. J.
The Austin Co., Cleveland.
Ayer Lord & Tie Co., Chicago.
Badger-Packard Machinery Co., Milwaukee.
Barrett Co., Chicago.
Beaudry & Co., Boston.
Berkshire Mfg. Co., Cleveland.

S. Birkenstein & Sons, Chicago.
G. S. Blodgett Co., Burlington, Vt.
Blystone Mfg. Co., Cambridge Springs, Pa.
Brass World Publishing Co., New York.
Bristol Machine Tool Co., Bristol, Conn.
Brown Specialty Machinery Co., Chicago.
Buckeye Products Co., Cincinnati.
Bullard Machine Tool Co., Bridgeport, Conn.
Carborundum Co., Niagara Falls, N. Y.
Central Electric Co., Chicago.
Champion Foundry & Machine Co., Chicago.
Frank D. Chase, Chicago.
Chard Lathe Co., New Castle, Ind.
Charles J. Clark, Chicago.
Cincinnati Pulley Machinery Co., Cincinnati.
Cleveland Osborn Mfg. Co., Cleveland.
Cleveland Pneumatic Tool Co., Cleveland.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Thomas E. Coale Lumber Co., Philadelphia.
Combined Supply & Equipment Co., Buffalo.
Corn Products Refining Co., Chicago.
Daily Iron Trade and Metal Market Report, Cleveland.
Dale-Brewster Machinery Co., Chicago.
Davenport Machine & Foundry Co., Davenport, Iowa.
Davis-Bournonville Co., Chicago.
Dayton Molding Machine Co., Dayton, O.
Deister Concentrator Co., Ft. Wayne, Ind.
Detroit Drill Co., Detroit.
Detroit Steel Products Co., Detroit, Mich.
Dings Magnetic Separator Co., Milwaukee.
Joseph Dixon Crucible Co., Chicago.
R. E. Ellis Engineering Co., Chicago.
Erwin Mfg. Co., Milwaukee.
Federal Foundry Supply Co., Cleveland.
Federal Machinery Sales Co., Chicago.
Foreign Crucible Co., New York.
The Foundry, Cleveland.
Foundry Appliance Co., Newark, N. J.
Foundry Equipment Co., Cleveland.
Foundrymen's Supply Co., Milwaukee.
Warren F. Fraser Co., Westboro, Mass.
Garden City Sand Co., Chicago.
General Electric Co., Schenectady, N. Y.
General Steel Co., Milwaukee.
Gooley and Edlund, Cortland, N. Y.
Gordon Sand Co., Conneaut, O.
Great Western Mfg. Co., Leavenworth, Kans.
Greaves-Klusman Tool Co., Cincinnati.
Grimes Molding Machine Co., Detroit.
Hauck Mfg. Co., Brooklyn, N. Y.
Hausfeld Co., Harrison, O.
Haynes Stellite Co., Kokomo, Ind.
Hayward Co., New York.
Henry and Wright Mfg. Co., Hartford, Conn.
Herman Pneumatic Machine Co., Pittsburgh.
Hoevel Mfg. Corp., New York.
Holcomb Safety Garment Co., Chicago.
Holland Core Oil Co., Chicago.
Hyatt Roller Bearing Co., New York.
Illinois Clay Products Co., Oglesby, Ill.
Imperial Brass Mfg. Co., Chicago.
Industrial Electric Furnace Co., Chicago.
International Molding Machine Co., Chicago.
The Iron Age, New York.
The Iron Trade Review, Cleveland.
Jennison-Wright Co., Toledo, O.
Chas. Jurack Pattern Works, Milwaukee.
C. C. Kawin Co., Chicago.
Kearney and Trecker Co., Milwaukee.
Spencer Kellogg & Sons, Buffalo.
T. B. Kelley & Co., New York, N. Y.
Kempsmith Mfg. Co., Milwaukee.
Julius King Optical Co., Chicago.
Laclede-Christy Clay Products Co., St. Louis.
H. M. Lane Co., Detroit.
Loewenthal Co., Chicago.
Lees Bradner Co., Cleveland.
David Lupton's Sons Co., Philadelphia.
Marshall & Huschart Machinery Co., Chicago.
J. S. McCormack Co., Pittsburgh, Pa.
McCrosky Reamer Co., Meadville, Pa.
McLain's System, Milwaukee.
McLain Carter Furnace Co., Milwaukee.
Mueller Machine Tool Co., Cincinnati.
Maclean Publishing Co., Toronto, Ont.
Macleod Co., Cincinnati.
Magnetic Mfg. Co., Milwaukee.
Mahr Mfg. Co., Minneapolis.
Marden, Orth & Hastings Corp., New York.
The Metal Industry, New York.
Metal and Thermit Corp., New York.
Modern Tool Co., Erie, Pa.
Monarch Engineering & Mfg. Co., Baltimore.
Mumford Molding Machine Co., Chicago.
Munroe Calculating Machine Co., New York.
Napier Saw Works, Springfield, Mass.
National Engineering Co., Chicago.
New Chicago Crucible Co., Chicago.
Wm. H. Nicholls Co., Brooklyn, N. Y.
Norma Co. of America, New York.
Norton Co., Worcester, Mass.
Oakley Machine Tool Co., Cincinnati.
S. Obermayer Co., Chicago.
Oesterlein Machine Co., Cincinnati.
Ohio Machine Tool Co., Kenton, O.
Oliver Machinery Co., Grand Rapids, Mich.
Oxwell Acetylene Co., Chicago.
Pangborn Corp., Hagerstown, Md.
Pawling & Harnischfeger Co., Milwaukee.
Peerless Machine Co., Racine, Wis.
Peck Iron & Steel Works, Kalamazoo, Mich.
Penton Publishing Co., Cleveland.
George F. Pettinos, Philadelphia.
Phoenix Mfg. Co., Eau Claire, Wis.
Pickands, Brown & Co., Chicago.
Pittsburgh Furnace Co., Milwaukee.
Portage Silica Co., Youngstown, O.
Henry E. Pridmore, Chicago.
Progressive Metal & Refining Co., Milwaukee.
Quigley Furnace Specialties Co., New York.
Racine Tool & Machine Co., Racine, Wis.
Richards-Wilcox Mfg. Co., Aurora, Ill.
Rivett Lathe & Grinder Co., Boston.
Robeson Process Co., New York.
Rogers Brown & Co., Cincinnati.
Rothacker Film Mfg. Co., Chicago, Ill.
Sand Mixing Machine Co., New York.
Schroeter Engineering Co., Chicago.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Sheriffs Mfg. Co., Milwaukee, Wis.
Simonds Mfg. Co., Fitchburg, Mass.
W. W. Sly Mfg. Co., Cleveland.
R. P. Smith & Sons Co., Chicago.
Werner G. Smith Co., Cleveland.
Southworth Machine Tool Co., Portland, Me.
Standard Optical Co., Geneva, N. Y.
The Standard Sand & Machine Co., Cleveland.
Sterling Wheelbarrow Co., Milwaukee.
Frederic B. Stevens, Detroit.
W. F. Stodder, Syracuse, N. Y.
Strong, Kennard & Nutt Co., Cleveland.
Sullivan Machinery Co., Chicago.
Swan & Finch Co., Chicago.
Thomas Elevator Co., Chicago.
Torchweld Equipment Co., Chicago.
United Compound Co., Buffalo.
United States Graphite Co., Saginaw, Mich.
U. S. Molding Machine Co., Cleveland.
U. S. Smelting Furnace Co., Belleville, Ill.
United States Silica Co., Chicago.
Wadsworth Core Machine & Equipment Co., Akron, O.
J. D. Wallace & Co., Chicago.
Warner & Swasey Co., Cleveland.
Western Electric Co., New York.
F. H. Wheeler Mfg. Co., Chicago.
Whiting Foundry Equipment Co., Harvey, Ill.
E. J. Woodison Co., Detroit.
Young Bros. Co., Detroit.

SOME NOTES ON BABBITT AND BABBITTED BEARINGS *

A Paper to Be Presented at the Fall Meeting of the Institute of Metals Division of the American Institute of Mining Engineers, Milwaukee, October 7th, 1918, by Jesse L. Jones, Metallurgist, Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

SUMMARY

1. Brinell tests at progressively increasing temperatures are given for a representative lead base and a representative tin base babbitt, which show that the former has a superior resistance to deformation at the working temperatures of bearings.

2. Small squares of bearing bronze, tinned and then babbitted with a representative lead base babbitt and a representative tin base babbitt were subjected to compressive loading. The lead base babbitt showed less average compression than the tin base babbitt. Compression did not materially increase the Brinell hardness of the babbitts.

3. A process and a tool are described for giving more accurate and smoother surfaces to bearings than has been heretofore possible.

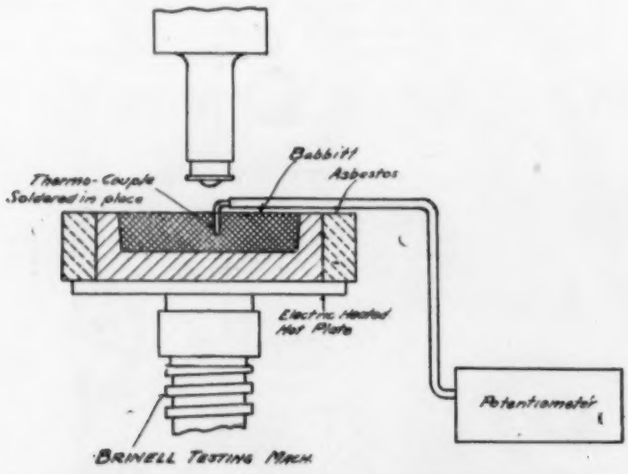


FIG. 1.—ARRANGEMENT OF APPARATUS FOR TESTING HARDNESS OF BABBITT AT VARYING TEMPERATURES.

The following rather unrelated experiments have recently been carried out in the Chemical Laboratory of the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

While the work is incomplete, it is described at the present time because it gives some data on the comparative merits of lead base and tin base babbitts and hence is of interest in connection with tin conservation.

BRINELL HARDNESS OF BABBITT AT INCREASING TEMPERATURES

Bearings fail because of wiping or deformation. Hence tenacity is desirable in a bearing metal, especially tenacity at high temperatures.

The Brinell test is commonly regarded as a measure of tenacity. In fact, it has been recently proposed to substitute for Brinell hardness number the expression "tenacity number."[1] It seemed, therefore, that the Brinell test was especially adapted for the tests described.

Discs, 4 inches in diameter and 1½ inches thick, were made of these babbitts which are designated as A, B and C. They were poured into metal molds, pyrometer leads being soldered in the center of each sample. The composition of the babbitts was as follows:

	A	*B*	*C*
Antimony	8	8⅓	14
Copper	2	8⅓	nil
Lead	nil	nil	78
Tin	90	83⅓	8

The discs were heated by means of an electric hot plate, the heating being controlled by suitable rheostats. The leads were connected with a Leeds & Northrup potentiometer which was used for measuring the temperatures. The discs were well insulated to prevent radiation losses and after the desired temperature was reached it was held for several minutes to guard against variations.

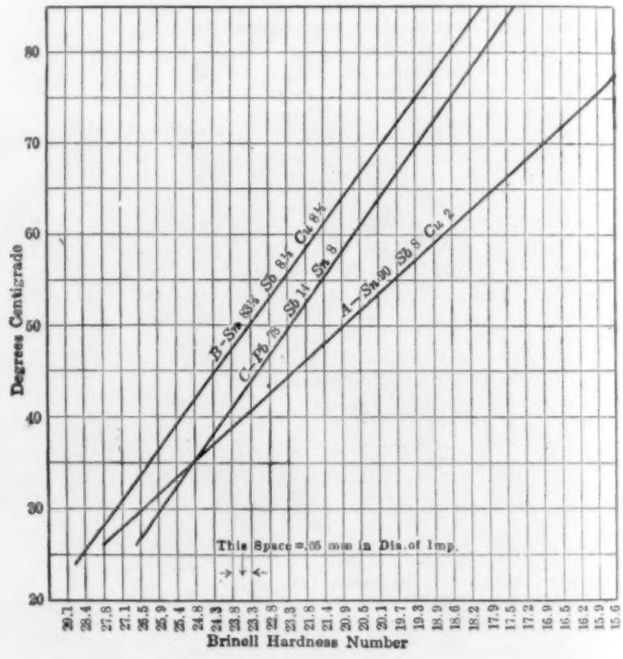


FIG. 2.—HARDNESS OF THREE BABBITTS AT VARYING TEMPERATURES.

The Brinell hardness tests were made on the bottom surfaces of the discs, a light machining cut being taken from each sample in order to secure a perfectly plane and smooth surface.

Figure No. 1 gives a sketch of the apparatus used for the test.

The Brinell hardness numbers obtained on these alloys at the various temperatures, were plotted and the results are shown on the curves given in Figure No. 2.

At 35°C. the hardness of the A and C babbitts is identical, but above this temperature the lead base babbitt has the higher hardness number.

The B and C babbitt results are almost parallel. The curves are not very far apart, and it is seen that the C curve is slowly approaching the B curve.

*Bulletin A. I. M. E., August, 1918, page 1395-1401.

[1] "Notes on Testing Hardness of Metals," J. W. Craggs, Journal of the Society of Chemical Industry, Vol. 37, No. 3, page 43 (T).

Complete results from the various test floors covering a number of years and a great variety of motors confirms the superiority of the lead base babbitt that is shown by these curves. The number of wiped bearings that had to be again babbitted was about 100 per month with the A babbitt, but not more than half a dozen per month when the C babbitt was used.

These practical results have led to the complete substitution of the C babbitt for all classes of machines and the complete elimination of A or tin base babbitt. Both experimentally and practically the lead base babbitt demonstrated that it had greater resistance to wiping or deformation at working temperatures than the tin base babbitt.

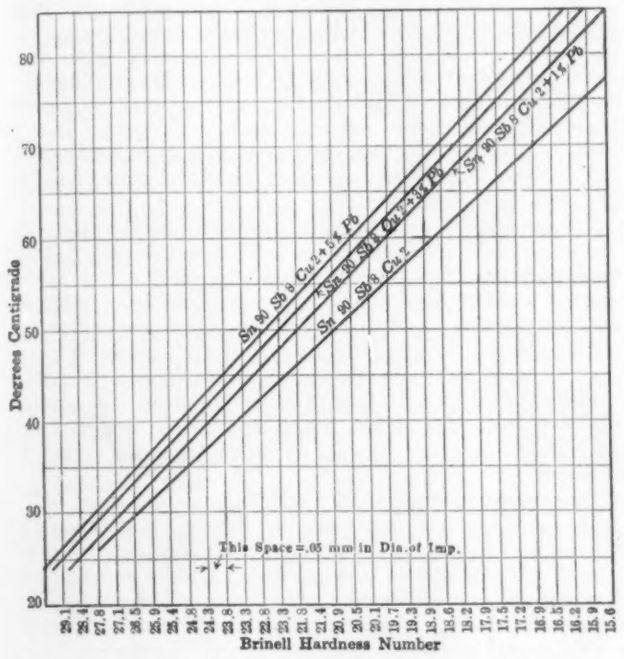


FIG. 3.—EFFECT OF LEAD ON HARDNESS OF A BABBITT.

The hard genuine babbitt B shown in Figure No. 2, while not regularly used, has been found very serviceable in the Kingsbury step bearing and other situations where the bearing pressure per square inch of area has been rather high. While the Brinell hardness shown in Figure No. 2 for the A and C babbittts is not far from the average hardness found for these alloys when using the standard hardness test piece, the hardness found for the B babbitt is much below normal. It should be about 38.0. The reason for the low Brinell hardness found is probably due to the fact that it is difficult to prevent the large amount of copper in this babbitt from segregating even when it is kept very hot and stirred continuously. The copper falls to the bottom of the melting pot and hence the stirring should aim to bring the metal from the bottom of the pot to the top, continuously. If this is not done, some portion of the bearings filled by the babbitt will be softer than other portions. The B formula is almost the same as the genuine babbitt of the Society of Automobile Engineers. It is also similar to the alloy known as Fahnig metal that is much used for lining aeroplane bearings abroad.

As it is the common belief among mechanical engineers that the addition of even a small amount of lead to a genuine babbitt renders it inferior, similar tests to those described above were run on the A babbitt to which 1%, 3% and 5% of lead had been added.

The addition of 1% of lead to the A babbitt made a decided improvement in the resistance of this babbitt to deformation at increasing temperatures. Additions of more than 1% of lead did not increase the hardness in the same ratio. The results of these tests are shown in Figure No. 3. These results are in harmony with the observations that have frequently been made by users of babbitt, viz., that when a small amount of lead has been added accidentally to a tin base babbitt that its hardness and anti-frictional qualities have been very much improved.

THE EFFECT OF COMPRESSION ON THE BRINELL HARDNESS OF BABBITTS

After a babbitted bearing has been bored out nearly to size, it may next be scraped until an accurate fit is obtained. This is a tedious operation and demands a skilled mechanic, hence reaming or broaching are often used instead of this method.

A reamer can be passed through a number of bearings so that they will all be lined up in one operation. Reaming at its best, however, is a rather violent operation, and after a reamer becomes dull this is especially true.

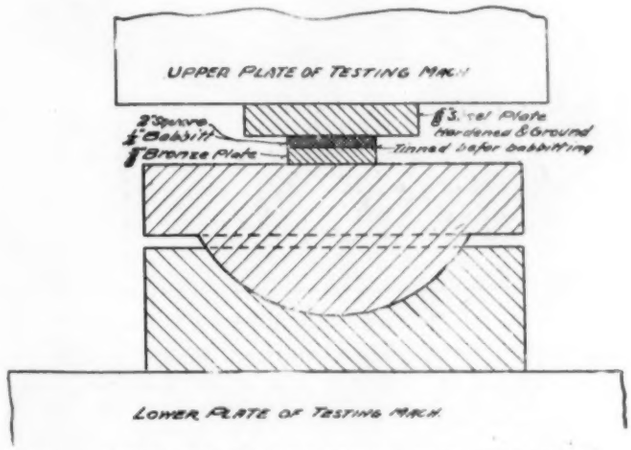


FIG. 4.—APPARATUS FOR COMPRESSIVE TESTS OF BABBITT.

Broaching is another operation much used. Broaches are pushed through the bearing by means of a hydraulic press until the required dimensions are reached.

In the case of large bearings, peening or compressing the babbitt by means of hammering is often specified.

The last two operations in particular are supposed to compress or densify the babbitt in a bearing and harden it so that it will give better service.

The following experiment was made to ascertain the effect of compression of babbitt on its Brinell hardness.

Two phosphor bronze plates (copper 80, tin 10, lead 10, phosphorus ½%), 2 inches square by ½ inch thick, were machined all over and then one face was tinned and babbitted with ¼ inch of babbitt, the B babbitt being used on one sample and the C babbitt on the other. The babbitt was machined to ¼ inch and the samples subjected to a compressive test, the apparatus shown in Figure No. 4 being used so that the load would be as uniformly distributed as possible. The successive loads and the corresponding Brinell hardness tests are given in the following table:

Load sq. in.	B Babbitt Average Compression	Brinell	C Babbitt Average Compression	Brinell
8,500 lbs.	.0020 inches	33.6	.0015 inches	23.8
10,000 lbs.	.0020 inches	33.6	.0020 inches	23.8
11,000 lbs.	.0055 inches	33.6	.0030 inches	24.8
12,000 lbs.	.0085 inches	33.6	.0032 inches	24.8
13,000 lbs.	.0140 inches	33.6	.0102 inches	24.8

The lead base babbitt stood up under the compression better than the tin base babbitt. When the load was increased to 30,000 pounds per square inch, however, the latter presented the better appearance as the babbitt had flowed uniformly over the edge of the bronze square in all directions, while with the lead base babbitt one side compressed more than on the other and the sample tilted even with the rocker testing device used. At a load of 30,000 pounds per square inch the bronze flowed also very appreciably.

These tests show that broaching, peening, etc., do not appreciably increase the hardness of babbitt and that

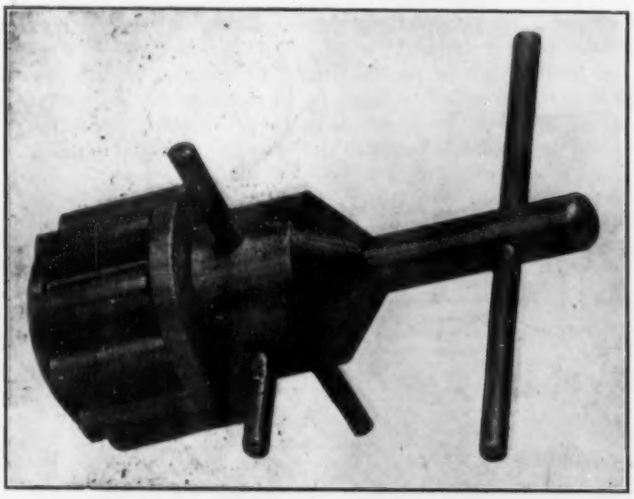


FIG. 5—THE MILLS MICROMETER ROLLER.

hardness must be obtained through quickly cooling the babbitt lining by means of water cooled mandrels, etc.

The microscopical examination of a lead base babbitt discloses a matrix or ground mass of several eutectics in which are embedded hard cubical crystals of tin antimonide. These crystals being relatively low in gravity tend to be more numerous in the upper portion of a babbitt lining. This lack of uniformity is guarded against by pouring a thin lining and chilling quickly. The secret of obtaining good bearings consists in keeping this matrix tough and hard.

Similar statements may be made in reference to the tin base babbitts although there is less tendency here for the tin antimonide crystals to rise to the surface, due to the lower gravity of these babbitts.

THE ROLLING OF BABBITTED LININGS BY THE MILLS MICROMETER ROLLER

As the above experiment of ascertaining the Brinell hardness of babbitt after compression showed practically no change in hardness, it was concluded that the various operations used in finishing babbitted bearings, such as peening, broaching and reaming, did not improve the hardness of the babbitt but left it practically as cast, at least as far as hardness is concerned. As these operations and the final operation of scraping the babbitt to fit, do not give a very satisfactory surface and it is still necessary to make a test run of bearings until the shaft is seated, there seemed to be no doubt that a marked improvement in the usual method of procedure was possible.

The so-called glass like surface that old bearings have is considered very desirable. Even if the babbitt is no harder than when cast, evidently all inequalities of the surface have been smoothed out by rotation of the shaft and friction has been reduced to a minimum. It occurred to the writer that by a rolling or burnishing operation, this desirable finish could be given to babbitt linings so that a machine could be operated at maximum speed as soon as finished without requiring any trial run.

A tool, Figure No. 5, designed by Mr. I. Mills, assistant superintendent of the Small Motor Deportment of the Westinghouse Electric and Manufacturing Co., seems capable of doing this work satisfactorily. It was made for the purpose of securing a better seat for the ball bearing races of a small aeroplane wireless generator. A variation of .0007" was found in the bearings and this could not be taken care of by reaming or machining. By the aid of this tool the seats in the aluminum alloy end brackets can be rolled to suit the individual variations of the ball bearings. A girl does the rolling and the bearings can be inserted or removed with the fingers. If the work is done by reaming, the bearings may fit extremely tight at first and when taken out be quite loose, due to burs, etc., being removed.

The same thing may be true of a babbitted bearing. It may be so tight a fit on the shaft when machining is finished that the shaft cannot be easily turned, yet after running a short time the fit may be too loose. A shaft accurately ground and then burnished, and an accurately rolled babbitted bearing with a definite clearance is certainly an ideal condition whose realization is to be desired.

While the Mills micrometer roller has been only made in a very small size as yet, it can be made in larger sizes and would then be capable of exerting much greater pressures.

The present instrument is made for a diameter of 1¾" and has a range of 5 mils plus and minus. It consists of 10 rolls which can be expanded by a micrometer screw through the medium of two tapered cylinders which give a parallel outward movement to the rolls. The vital point of the instrument is that the rolls are not equally spaced as this would cause them to groove the surface rolled. Instead the rolls are staggered, the distances between them being slightly varied and the result is that extremely accurate work can be done. Variations of .0001" of an inch are possible when rolling bearing seats.

A trial of this method of rolling babbitted linings is being made on two sets of connecting rod crank shaft bearings of the Liberty Engine, one set being filled with the lead base babbitt referred to above as C and the other with the tin base babbitt B. A description of the difficult conditions that are encountered in the bearings of the Liberty Engine due to its great power are given in a very interesting paper entitled "The Metallurgist and the Aircraft Program," by Lieut. H. F. Wood, U. S. Army, Signal Corps.[2]

The results obtained with the above two sets of bearings and as well as the results of trials of larger bearings, some of which have been rolled and others finished by the ordinary methods, will be available at a later date.

The Mills micrometer roller is equally well adopted for rolling bronze bearings. One reason why unlined bronze bearings cannot be used successfully without heating is because the bearing load is unequally distributed and the pressure per square inch is so excessive in some spots that heating results. The perfectly smooth and uniform surface produced by rolling ought to make the use of unlined bearings possible to a greater extent than at present.

[2]Proceedings of the Steel Treating Research Society, Vol. 1, No. 9, page 15 (April, 1918).

ELEMENTS OF ELECTRO-CHEMISTRY

SOME INSTRUCTION FOR THE PLATER WHO WISHES TO UNDERSTAND THE THEORY OF WHAT HE DAILY PRACTICES
WRITTEN FOR THE METAL INDUSTRY BY JOSEPH HAAS, JR.*—THIRD PAPER.

7. HYDROLYSIS

When a solution of iron chloride, $FeCl_3$, or a solution of sodium carbonate, Na_2CO_3, is tested with litmus paper, it has been found that the $FeCl_3$ solution will give an acid reaction, while Na_2CO_3 solution will give an alkaline reaction. That is, in the case of $FeCl_3$, H ions are indicated. The Na_2CO_3 solution indicates the presence of OH ions. In order that this may be explained it becomes necessary to take into consideration certain properties of water, usually ignored; that is the presence of a small amount of H ions and OH ions. The dissociation is quite small and may readily be ignored in most cases, but when it becomes necessary to consider bodies which while they exhibit greater ionization than water, but are still not so very far from it in that respect. The small concentrations of H ions and OH ions play a very important part. The substances as $FeCl_3$ and Na_2Co_3 give acid and alkaline reactions respectively, because the phenomena known as hydrolysis takes place. In other words, the dissociated water takes part in the reaction. The two substances when in solution conforming to ionization are as follows:

$$FeCl_3 = Fe + Cl + Cl + Cl$$
$$Na_2CO_3 = 2\,Na + CO_3$$

Carbonic acid (H_2CO_3), the acid from which, Na_2CO_3, is formed, is a substance, but slightly dissociated more than water, so that H ions, usually present in water, cannot remain as such, but combine with CO_3 to form undissociated H_2CO_3 by reaction $2\,H + CO_3 = H_2CO_3$. This leaves OH ions in the solution, which gives solution its basic reaction.

The hydrolysis of $FeCl_3$ results in the formation of hydrochloric acid and ferric hydroxide. It is the formation of HCl that gives the acid reaction.

$$\begin{array}{ccccc} FeCl_3 & = & Fe & + & 3\,Cl \\ & & + & & + \\ 3\,HOH & = & 3\,OH & + & 3H \\ & & \| & & \| \\ & & Fe\,(OH)_3 & & 3\,HCl \end{array}$$

The general rule as regards hydrolysis is that salts formed from strong acids and strong bases are not hydrolyzed. Hydrolysis takes place when the salt:

(1) Is the result of a reaction between a weak acid and a strong base.

(2) Is the result of a reaction between a strong acid and a weak base.

(3) Is the result of a reaction between a weak acid and a weak base.

MAGNETISM AND ELECTRICITY.

At this point I think it well to introduce and explain some terms and topics that are dealt with under the general name of "Magnetism and Electricity," but which are usually omitted from articles on electro-chemistry. But I think it of advantage to the plater to understand so as to more easily comprehend pure electro-chemical phenomena. The topics will be magnetism, voltaic electricity, electro-magnetism; electro-magnetic induction and dynamo electric machines.

MAGNETISM

A magnet is a piece of iron or steel which has the property of attracting other pieces of iron and steel which are called magnetic bodies, and when freely suspended in the air by a string of assuming a north and south position in respect to the surface of the earth. The ends of the magnet are called poles, and that end which points to the geographical North Pole is called a north pole, and is designated by N. The other end is called the south pole, and is designated by S. The general laws of magnetism are that like poles repel and unlike poles attract. That is, if two N. poles of two magnets are brought together, there will be no attraction between them, but if a N. and S. pole of different magnets are brought together they will attract one another and stick together. There is a distinction between magnets and magnetic substances. A magnet attracts only at its poles, each of which possesses opposite properties. A piece of iron, however, will be attracted to a magnet, no matter what part of it is approached to the magnet. A magnetic substance, therefore, possesses no fixed poles, while a magnet has at least two poles, one of which always repels the like pole of another magnet. The magnetic substances or metals used in practice are steel and iron, but cobalt, nickel and chromium are also attracted to a magnet to a slight extent.

The force exerted by one magnet on another, or to attract iron filings, nails, etc., is termed magnetic force. When a magnet is plunged into filings the space thus occupied can be shown to be penetrated with the force, and the filings serve as a useful indicator to show the nature of the force, its direction, and its destination in space surrounding the magnet. To actually see these things, place a bar magnet on a table, and cover it with a piece of cardboard. Sieve some filings on the cardboard and then give the edge of the cardboard a tap with a pencil. This magnetic force is not the same at all distances from the magnet, but decreases as the distance from the magnet increases. The magnetic force emanates in all directions from the magnet, with greatest concentration of strength at the poles. The space surrounding the magnet which is penetrated by magnetic lines of force is called the magnetic field of force. It is assumed that the magnetic lines of force emanate from N. pole of a magnet, pass through surrounding medium (air), re-enters the S. pole to N. pole through magnet itself. Every line of magnetic force has a complete circuit, independently, and never cuts, crosses or merges into each other.

What is known as the molecular theory of magnetism has been offered as an explanation of the phenomena arising from the magnetism of a piece of iron or steel. The theory is assumed that in a bar of steel each individual molecule that composes it is a magnet, and if the steel is unmagnetized, the molecules are arranged in a haphazard manner in the steel, but still according to the law of attraction between unlike poles. The magnetic circuits are thereby satisfied internally and there is no external manifestation of magnetism. But in a magnet, or a piece of steel magnetized, the molecules rearrange themselves according to the law of attraction, symmetrically, all the N. poles pointing in the same direction and the S. poles in the opposite direction. Thus all the force is concentrated or directed in the same direction so that external manifestation of magnetism becomes visible. Magnetic substances possess different degrees of retaining magnetism which is called its "retentivity." Steel, although more difficultly magnetized than iron, retains its magnetism better.

When a piece of soft iron or steel are placed in a mag-

*Mr. Haas is now a sergeant in the Overseas Surgical Instrument Repair Unit with the American Expeditionary Forces in France.

netic field, they become temporarily magnets, having two unlike poles. The iron or steel are bodies under "induction" and the magnet is known as the "inducing body," and the phenomenon is known as "magnetic induction." Magnetic induction is defined as the action and reaction which occur when magnetic lines of force, emanating from a magnetic body make evident the latent magnetism in a magnetic body, either with or without contact. The phenomenon of magnetic induction always precedes the attraction of a magnetic body by a magnet and takes place through all non-magnetic mediums, whether they be liquids, solids, or gases. One pole induces the opposite pole at that part of the body under induction nearest to the inducing pole, and a like pole at the most remote point.

VOLTAIC ELECTRICITY.

If a beaker is nearly filled with dilute sulphuric acid—H_2SO_4—as 1 part acid to 15-20 parts water, and a strip of zinc about 1 inch wide and six inches long be immersed in the acid solution, it will be observed that bubbles of gas collect instantly on the zinc, become detached and rise to the surface of the solution, being rapidly replaced by other bubbles as the action continues. These bubbles of gas are hydrogen. If the zinc was left in this solution, it would entirely disappear.

A strip of copper of the same dimensions as that of the zinc plate is immersed in the same solution, no action will take place. If, however, both copper and zinc are placed into the acid, taking precautions that the electrodes do not touch, the zinc is still the only one upon which action can be observed. But, if the electrodes are allowed to touch, besides the H. gas coming off from zinc, a gas will be seen arising from the copper electrode, which is also hydrogen. If the action is allowed to continue, the zinc electrode would waste away, but the copper plate would not be affected.

Upon breaking the contact between the two electrodes, the gas will cease upon the copper plate, but still continues on the zinc plate. If the zinc electrode was removed and while still wet and the surface rubbed with a little mercury, no action upon the zinc electrode will take place when it is placed into the solution. Now, when the copper and zinc electrodes are allowed to touch, bubbes of hydrogen rise only from the surface of the copper electrode. If the two electrodes are connected with a wire, and the extremities of the wire are joined, a magnetic needle, when brought near the wire, will be deflected from its normally N-S position, indicating that a current of electricity is flowing through the wire. The current of electricity flows only so long as the wires are connected and ceases to do so when the contact is broken. The conclusion arrived at is that a metallic contact between the plates is necessary to cause a chemical action.

If an iron rod was to be tested for magnetism by dipping into iron filings, it would be found that it does not attract them. But, if a few turns of cotton covered wire is wound around the iron rod, and then plunged into iron filings after connecting the ends of the wire to the electrodes, the filings will be attracted to the iron, but will drop off when the connection between the plates is broken. A current of electricity can therefore induce magnetic properties to magnetic substances temporarily.

From the foregoing, it appears that when zinc and copper are immersed in an acid solution and connected by a wire, the wire possesses unusual magnetic properties. The cause of this magnetism and other effects that will be noted later is attributed to electricity. The property possessed by the wire is said to be due to a transfer of electricity from one plate to another, the wire acting as a conducting medium. The two plates in the beaker are said to be electrified to different degrees of electrification, and when they are connected by a wire, the electrification discharges from the higher to the lower electrified plate. The action of the acid upon one plate more than the other, tends to keep the plates at different states of electrification and successive discharges through the connecting wire become so intensely rapid that they form practically a continuous flow of electricity.

The above method of producing an electric current is called a galvanic or voltaic cell, which is any arrangement, resulting from a chemical reaction, or such a physical process of diffusion that it produces electrical energy.

Science has assumed from experiments that electricity flows from copper terminal to zinc terminal and from zinc plate to the copper plate through solution. The copper plate is called the negative plate and zinc plate the positive plate. While the external end of copper plate or any wire attached to it is called the positive pole, and the external end of the zinc plate, or wire attached to it the negative pole. In the following picture, the direction of the arrows indicates the direction of the flow of the electric current internally and externally.

Take, for instance, two vessels partly filled with water on the same level table, and connected with a rubber hose, which is also filled with water. The water will not flow from either vessel to the other because the pressure at the ends of the hose is the same. But if one vessel is lowered to the floor, the water will flow from the top one to the lower one because the pressure at the upper end of the tube is now greater than that at the lower end.

Likewise, if two ends of a bar of metal are heated to the same temperature, there is no transfusion of heat from one point to the other. If, however, only one end is heated, the other becomes also heated, due to the transfusion of heat from the point higher to the point lower in temperature.

The word "potential," as used in an electric sense, is analogous to the "head in liquids" and "temperature in heat." In the voltaic cell, then, we have two bodies raised to different states of electrification, called "potential," and to this difference of potential between them is due the current flowing through the wire connecting the plates. The greater this difference of potential, the greater the current, or effect of the current produced. Potential, then, is the force that moves electricity through any circuit. The total force required to cause the current to flow through the entire circuit is called "electro-motive force," whereas a difference of potential would exist between two points of the circuit which would cause current to flow just between these two points. Electro-motive force or E.M.F., is the total difference of potential that is maintained in a circuit.

In the working of a galvanic cell, if it is connected with a galvanometer, the deflection of the needle will be noticed to gradually fall and become much less than at first. The reason is that the copper plate, coated with hydrogen, becomes practicaly a hydrogen plate. The voltaic cell is then to all purposes one with H. and Zu. electrodes, whose tendency is to set up a current in the opposite direction to that of a Cu. and Zu. cell.

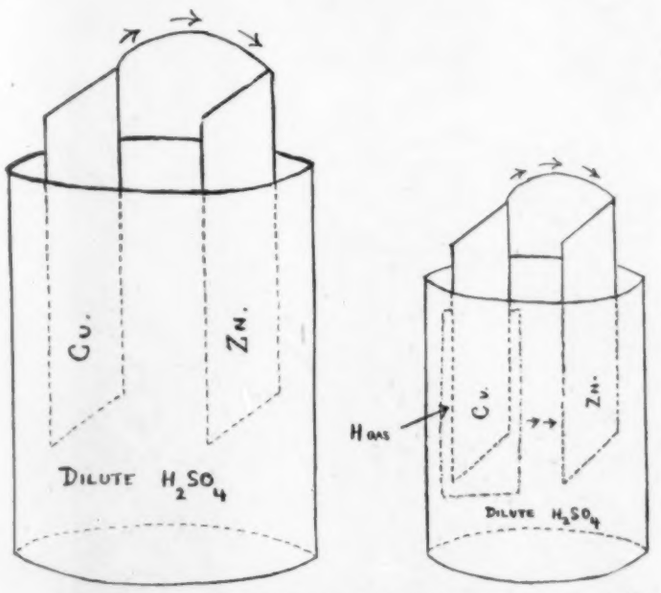
When all becomes weakened in this manner by a coating of hydrogen bubbles, as in this case, on the negative plate, it is said to be polarized, and the phenomenon is known as polarization.

If either two plates of Cu. or Zu. are immersed in the same electrolyte, there is a tendency of opposing cur-

rents, which neutralizes each other, and since there is no difference of potential between them, no current flows. The essential part of any cell is, then, any two dissimilar metals immersed in an acid solution. One of the metals must be more readily acted upon than the other. The greater the difference in intensity of chemical action, the greater the difference of potential and consequently the greater the current strength.

ELECTRO-MAGNETISM

Electro-magnetism is distinguished from the magnetism in a permanent steel magnet, in that the air around a magnet is continually charged with a magnetic force, while a wire conveying an electric has magnetic effects produced around the conductor only so long as an electric current is passing through it. Every wire which is carrying a current has around it a magnetic field made up of magnetic forces in concentric circles around the wire. This fact can be proved by simply bringing a compass needle near the wire, and the magnetic field of the wire acts on the magnetic field of the compass, causing a deflection of the needle, in the same way as would happen if the compass were brought near a permanent steel magnet.



SKETCH SHOWING DIRECTION OF ELECTRIC CURRENT IN A GALVANIC CELL.

ELECTRO-MAGNETIC INDUCTION

In the section just previous, it has been stated that around a wire conveying an electric current there existed a magnetic field. The corollary to this would be that if a wire were moved through a magnetic field, a current of electricity would be produced in it. Faraday discovered this to be so. If a wire is so arranged as to form a closed circuit, and the wire is then moved through the magnetic field of a permanent steel magnet, a current of electricity is produced in the wire. The current so generated is known as an induction current, and the phenomenon as "electro-magnetic induction." It is an important principle upon which depends the operation of the dynamo used by platers.

THE DYNAMO ELECTRIC MACHINE

The dynamo is a machine that converts mechanical energy into electrical energy by means of electro-magnetic induction. A dynamo does not produce electricity, but produces an E.M.F., which causes a current of electricity to flow through a properly insulated system of electrical conductors external to it. The dynamo used by platers consists of a magnetic field, produced by electric magnets, and a number of coils of wire wound upon an iron core forming an armature, and so arranged that the number of magnetic lines of force of the field passing through these coils constantly varies, producing thus a continuous E.M.F. by means of a commutator, to which are connected the coils of the armature, the current produced by the induced E.M.F. is made to flow in one direction, and by means of brushes resting on the commutator, the current is carried to the external circuit that is connected to the brushes.

(To be continued.)

GOVERNMENT SPECIFICATIONS FOR COPPER AND NICKEL PLATING

By Charles H. Proctor, Plating Editor

Recent United States Government specifications covering requirements for copper and nickel plating for rust-proofing iron and steel parts for aeroplane construction such as gray iron cylinders, are as follows:

NICKEL PLATING.

Nickel plating may be produced (a) directly on steel, or (b) with a preliminary coating of copper in a cyanide copper bath. If the nickel is deposited directly on the steel the average thickness of the nickel should not be less than 0.0006 inch (0.015mm). To produce such a deposit, if 75 per cent. efficiency is assumed, it will require about 15 ampere hours per square foot of surface. If copper is first deposited the average thickness of the copper and the nickel shall each be not less than 0.0004 inch (0.01mm). To produce such a deposit of copper in the cyanide bath, assuming 70 per cent. efficiency, will require about 5 ampere hours per square foot. To produce an average thickness of nickel of 0.0004 inch, assuming 75 per cent. efficiency, will require 10 ampere hours per square foot of surface.

It is the writer's opinion that gray iron cylinders should first be thinly coated with nickel, then plated in a warm copper cyanide solution of the following composition:

Water	1 gallon
Sodium cyanide	6½ ounces
Copper cyanide	5 ounces
Soda ash	3 ounces
Caustic soda	¾ ounce
Sodium hyposulphite	¼ ounce

If this solution is used at 3½ to 4 volts it will readily give from 10 to 15 amperes per square foot of surface, and a heavy enough deposit should be obtained in 45 minutes.

After copper plating the cast iron cylinders should be plated in a nickel solution of the following composition:

Water	1 gallon
Double nickel salts	8 ounces
Single nickel salts	2 ounces
Boracic acid	2 ounces

The solution should be used at a voltage of from 3 to 3½ and 10 amperes per square foot of surface. The time of deposit should be 45 minutes.

By preliminary coating the iron with nickel, then copper plating, and finally nickel plating, the cylinders should stand up under the salt water test. The advantage of the method outlined is that the cast iron is electro-positive to the nickel, the copper is electro-negative to the nickel, and by breaking up the polarity of the metals as outlined a more satisfactory coating will be produced that will withstand corrosion more readily.

WAR EFFORT OF THE MIDLANDS

How a Birmingham, England, Metal Firm Makes Munitions

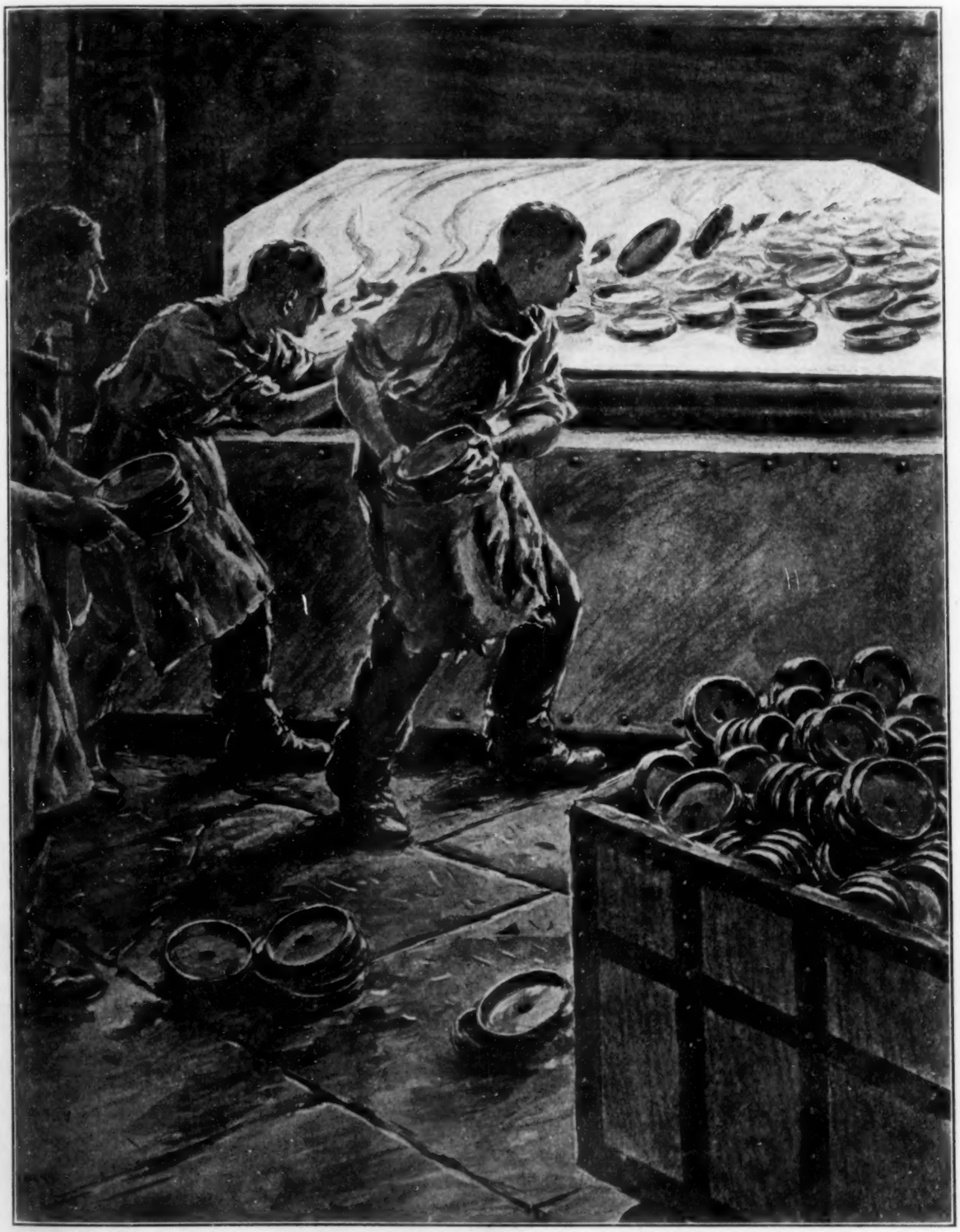
The pictures here shown are taken from drawings by Artist S. Bigg in the London Illustrated News and portray how metal is handled in Birmingham, England. The casting shop and annealing furnace shown are at the plant of Elkington & Company, Birmingham, England. The workers in the first picture are pouring brass ingots from metal recovered and refined from scrap. This is substantially the same way that we used to pour

CASTING BRASS INGOTS FROM SCRAP METAL IN THE MIDLANDS, BIRMINGHAM, ENGLAND.

metal in the United States. The small floor mold has practically now gone out of use, the larger pouring unit now being preferred.

Our second picture shows a rather primitive method of manning an annealing furnace for copper shell bands. The workmen ought to make good "bombers" after such strenuous practice. We would like to have another picture to see how they fish the bands out of the furnace.

In this country of course the bands are loaded on shallow iron pans which would hold about three thousand pounds and then the pans are drawn into the furnace which is open at both ends. On completion of the annealing operation the pans are drawn out of the opposite end of the furnace.



ANNEALING COPPER DRIVING BANDS IN THE PLANT OF ELKINGTON AND COMPANY, BIRMINGHAM, ENGLAND.

LEAD PLATING

SOME INFORMATION REGARDING THE ELECTROLYTIC DEPOSITION OF LEAD—ISSUED AS A PRELIMINARY CIRCULAR BY THE BUREAU OF STANDARDS, WASHINGTON, D. C.

1. INTRODUCTION.

This circular has been prepared at the request of and in collaboration with the Ordnance Department of the War Department. It is, however, only a circular of information and does not replace or supersede any of the specifications or requirements of the Ordnance Department.

The recent increased application of lead plating, especially in connection with gas shell, has given rise to numerous inquiries for information on this subject from military officials and from manufacturers. The purpose of this circular is to give a condensed summary of information which may be of value in this connection. No claim is made in it for completeness or originality. The facts have been gathered from the literature of the subject and from manufacturers and platers, who have in general furnished freely all the information at their disposal. It is not possible in a circular of this scope to determine or acknowledge the exact credit due to any author or investigator for the various methods or processes described, hence no reference to authors or firms will be made.

This circular will be revised from time to time as conditions warrant. Additional copies may be obtained upon request addressed to the Bureau of Standards. The Bureau will be pleased to furnish any additional available information and to assist platers and manufacturers in the operation and installation of lead plating baths. This work is a part of the general plan to assist wherever possible in the plating of military supplies.

2. GENERAL PRINCIPLES.

Lead plating is conducted similarly to any other plating operation, and can be readily installed and operated wherever there are plating facilities and an experienced plater. Wooden tanks, preferably lined with asphalt or bitumen, should be employed. Lead or iron linings may not be used. The solutions after mixing are not especially corrosive, and are not so poisonous as are many other plating solutions that are commonly used. Danger of lead poisoning may be avoided by the use of the customary precautions, e.g., use of rubber gloves, and thorough washing of hands and face before eating.

Briefly, the operation of lead plating consists in hanging the properly cleansed articles (usually steel), in the plating solution, upon the cathode rods, and suitable sized lead plates or sheets on the anode rods. Upon applying the current, lead is dissolved from the anodes and deposited in almost equal amounts on the cathodes. A direct current low voltage generator, such as commonly used in plating, is the most desirable source of current. Where attempts are made to use the lighting circuit, e.g., at 100 V, it is necessary to plate a large number of articles or tanks in series, under conditions which are not conducive to satisfactory work.

The only two solutions in extensive commercial use are the fluosilicate and the fluoborate solutions. The former is made by dissolving lead carbonate (white lead) in fluosilicic acid, which is in turn prepared by the action of hydrofluoric acid on silica. As the preparation of the fluosilicate solution is a rather complicated process, it is customary for the platers to purchase this solution from refineries, in which it is used on a large scale for the refining of lead. Observation has shown that most of the platers using fluosilicate solutions make further additions, e.g., of glue, molasses, oxalic acid, etc., to the solution as purchased. The fluoborate solution is prepared by dissolving boric acid in hydrofluoric acid, and then adding the white lead (in the form of a paste) and the requisite amount of glue, after which the solution is diluted to the desired volume or density.

It has been found that dense satisfactory deposits of lead can be produced in either the fluosilicate or fluoborate solutions. The fluosilicate solution can be prepared (on a large scale) somewhat more cheaply than the fluoborate. The advantages of the fluoborate solution are (1) it can be prepared by any operator from chemicals easily obtainable, (2) it may be used to plate directly on steel, whereas in the fluosilicate solution the steel must be first copper plated or receive other special treatment, and (3) the fluoborate solution is less readily decomposed and produces less sludge than does the fluosilicate. While there is no occasion to question the efficacy of the fluosilicate solution where it is in use, it is believed that for new installations the fluoborate solution will be most satisfactory.

So far as known, the perchlorate solution has never been employed on a commercial scale.

3. PREPARATION OF THE SURFACE FOR PLATING.

No special procedure is required to prepare steel for lead plating, in fact, the solutions and equipment in general used in plating plants may be employed. The cleaning must, however, be very thorough in order to obtain impervious, adherent deposits. Where the work as received is heavily coated with grease, washing with gasoline will remove most of it, after which the steel may be treated with any efficient cleaner, either directly or by electrolytic cleaning. If, as is generally the case, the surface to be plated has been machined, only slight pickling with acid will be required. In cases where this is not sufficient, e.g., where there is heavy scale, it should be removed by sand blasting, rather than by prolonged pickling, which may cause serious injury to the steel.

4. CONDITIONS OF OPERATION.

A. Fluosilicate Solutions.

The solutions in common use contain from 10 to 14 ounces per gallon of lead fluosilicate and from 8 to 12 ounces per gallon of free fluosilicic acid, with from 0.025 to 0.05 ounces per gallon of glue. The specific gravity of the solution is usually 1.12 to 1.14 (15.5° to 18° Baume). As previously stated, steel must be first copper plated (in a cyanide solution) or treated by some other special process before lead plating in this solution. In still solutions the current density rarely exceeds 10 amperes per square foot, while in agitated solutions, from 15 to 25 amperes per square foot may be employed. In this, as in all lead plating processes, the anodes should be of high grade lead, containing at least 99.5% lead.

B. Fluoborate Solutions.

The fluoborate solutions in commercial use have approximately the following composition:

2 lbs. of 40% hydrofluoric acid.
12 oz. boric acid.
1 lb. white lead.
0.025 to 0.050 oz. glue.
Sufficient water to make 1 gallon of solution.

The white lead used in the preparation of the bath should be a pure basic carbonate, free from zinc oxide, barium sulphate, etc. If other strengths of hydrofluoric acid are employed, corresponding amounts should be used, e.g., 2.7 lbs. of 30% acid, or 1.6 lbs. of 50% acid.

The solution has a specific gravity of approximately 1.115 (15° Baume). It is prepared by first dissolving the boric acid in the hydrofluoric acid. (Caution—Hydrofluoric acid is very corrosive and should not be allowed to touch the skin). The white lead is then added in the form of a thin paste in water. After effervescence has ceased, the glue, previously dissolved in a little warm water, is added, and the solution is diluted to the desired volume or specific gravity. This solution is operated at ordinary temperature, using a current density of 10 to 20 amperes per square foot in still baths, and 20 to 30 amperes per square foot in agitated baths. The solution has a low resistance so that no unusual voltage is required. The actual voltage required, which should be adjusted to produce the desired current density, will vary with the shape, size and distance of the electrodes. It is usually less than 1 volt and will rarely exceed 2 volts. Small additions of glue (e.g., half the original amount) should be made whenever the deposited lead shows any evidence of roughness or "treeing." The solution should be filtered occasionally to remove suspended matter, especially if it is agitated when in use. The anodes are readily dissolved, so that it is not necessary to have anodes larger than the cathodes. They may be even decidedly smaller, especially in agitated solutions.

5. Special Applications of Lead Plating.

A. Plating of Boosters and Adapters for Artillery Ammunition.

Since the purpose of lead plating of these is to protect the booster, and especially the welded joint, from the attack of the liquids used, and at the same time to produce a tight joint when the adapters are threaded into the shell, it is important to have a dense, fairly heavy deposit of lead over the outside of the booster and adapter, up to the top of the threads. For this purpose it is, therefore, desirable to have a lead coating with an average thickness of at least 0.05 in. The boosters and adapters can probably be most conveniently plated by the use of suitable racks, holding a large number of pieces, the position of which can be so adjusted as to immerse them in the solution to the desired depth.

B. Lead Plating of Shell.

Shells are lead plated on the inside for the purpose of protecting the steel against the action of the liquids contained; or, in some cases, simply in order to increase the weight of underweight shells. In either case the deposit should be dense and adherent, and should cover the entire inner surface, nearly to the top of the threads, since even if the shells are lead plated only to increase the weight, they should be so plated as to be available for those uses for which the lead plating is required. When plated for protection, the deposit should be fairly thick, in order to insure a satisfactory minimum thickness at every point. A thickness of 0.005 in. to 0.008 in. is probably sufficient. When shells are plated solely to increase the weight, the amount to be deposited will depend on the deficiency in weight, but the deposit should in no case be less than 0.005 in. in thickness. In order to insure the desired weight, and to produce a satisfactory coating, from 10 to 20% more lead should be deposited than is required to bring the shell to the lower weight tolerance, or to the required minimum thickness.

In general it will be found necessary to agitate the solution when plating in a restricted volume, as in a shell. This can be most simply accomplished by a rather slow (e.g., 300 r.p.m.) revolution of the anode. A form of anode stirrer which has given very satisfactory service, consists of a wooden paddle to which a strip of lead, weighing at least 50% more than the required weight of deposit, is attached. By having the lead strip slightly narrower at the top than at the bottom, and having the lead folded over the bottom of the wood strip (e.g., through a slot) a fairly uniform coating of lead is produced on the inside of the shell. By weighing each anode before and after plating, the amount of lead deposited on the cathodes can be estimated very closely, and more readily than by weighing the shells.

C. Lining of Tanks, Kettles, Etc., With Lead.

While lead plating has not been extensively employed for this purpose, there is reason to believe that very satisfactory adherent deposits can be produced, up to 1/16 in. or more in thickness. The advantages of an adherent deposit are obvious, especially in the case of vacuum stills. This subject is now being investigated, and hence no details can be furnished at this time. In general, however, the surface should be prepared by sand blasting rather than pickling, in order to increase the adhesion of the lead. The size and shape of anodes and methods of agitation to produce uniform deposits will vary with the shape of the vessel to be plated.

6. Testing of Lead Deposits.

A. Thickness.

The average thickness can be estimated from the weight and area of the deposit, the former being obtained by weighing typical specimens before and after plating. In the case of relatively small parts, e.g., boosters and adapters, it will probably be most convenient to weigh collectively, just before and after plating (in each case when dry) a number, e.g., 10 marked pieces, which should be distributed in the bath as to represent average conditions of plating.

A simple test in use for the thickness of lead on the inside of shells, consists in dropping a small steel ball from a definite height (e.g., 6 feet) through a glass tube, one end of which rests on the inside bottom of the shell. The thicker the lead coating, the less will be the height to which the ball will rebound. This test is purely empirical, but by "standardizing" it upon deposits of known thickness, approximate results can be quickly obtained. An adequate thickness of coating upon the bottom of the shell is not a guarantee of proper distribution, but in those cases where shells so tested were subsequently sawed through and examined it was found that in general a thin deposit on the bottom was accompanied by thin deposits on the walls and vice versa.

B. Permeability.

Since the purpose of the lead coating is principally to protect the steel, the best test of quality would be a test for pin-holes or porosity. Such a test is important, since in common with all electro-deposited coatings, lead plating is more or less porous. From preliminary tests it appears probable that a coating of 0.005 in, or more of lead, deposited under proper conditions, will properly protect the steel. A simple test for pin-holes in lead coatings has been devised, which is a modification of the well-known ferroxyl test. The samples to be tested are dipped into, or otherwise subjected for 1 minute, to a solution containing 2% of (pure) sulphuric acid and 1% of potassium ferricyanide. Bright blue stains or spots will appear wherever the iron is exposed. The details and applications of this test are now being studied at the Bureau of Standards, and will be published shortly.

The salt spray test may also be applied to detect imperfections in the lead coating, but is not so convenient or rapid.

(To be continued.)

SOLDERS AND SUBSTITUTES FOR LEAD-TIN SOLDERS

SOME NOTES ON THE RESULTS OF EXPERIMENTS CONDUCTED IN THE RESEARCH LABORATORY OF THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, PITTSBURGH, PA.

WRITTEN FOR THE METAL INDUSTRY BY CHARLES W. HILL.

Some time ago, the writer made a series of experiments with various solders, and while the object was not that of finding a substitute for regular solder, the results have a bearing in this direction and may be of interest at this time to readers of THE METAL INDUSTRY who are desirous of conserving tin. It is to be regretted that we have not had the opportunity to make other tests which might be desirable in order to make a complete report on the subject. It is hoped, however, that these notes, although scattered, may prove of value. This will be especially true if their publication may induce others with greater experience to make known their results at this time.

I. PRESENT SOLDERS

The following solders containing tin are probably the more important in commercial use.

Name	Composition-Percent of Tin	Lead	Bismuth	Melting Range ° C.	Range ° F.
Tin	100	..	..	232—232	445—445
Special	70	30	..	181—185	358—364
Tinning Solder	85	15	..	181—210	358—410
Zinc Solder (5:3)	62.5	37.5	..		
Half and Half	50	50	..	181—240	358—464
Wiping Solder	33	67	..	181—250	358—480
Pattern Solder	19	31	50	? — 90	? —190

(Melting Range taken from diagram in Landolt-Boernstein. The figures are somewhat different than those found in practice.)

The higher melting point solders such as silver solder or the brazes do not contain tin. It is interesting to note that there is a gap in our commercial solders in melting points from that of pure tin, 232° C. to that of the brazes which melt around 650° C.

II. SOLDER CHARACTERISTICS AND REQUIREMENTS

As soon as we begin to look about for substitutes for the various tin solders to which we have become accustomed, we are confronted with the propositions of appropriate tests for solders and requirements or specifications which we must have in a substitute solder to allow its use.

Now the characteristics of solders are many, and the importance of any characteristic varies somewhat with the proposed use of the solder. Possibly we can make a step toward order if we consider the characteristics of solders from three standpoints,—(1) Physical properties of the solder itself, (2) characteristics related to the melting of the solder, (3) the action of soldering, and (4) characteristics of the soldered joint.

1. Physical Properties of Solders. About the only physical property of the solder itself as different from the requirements involving the process of soldering is that which permits of extrusion. For many uses the wire or strip form of solder is almost a prerequisite and solders which are brittle or which cannot be extruded are of little commercial value.

Some investigators have subjected cast pieces or wires of solder to the customary breaking tests. It has been the experience of the writer that such tests are of little value and are quite likely to be misleading. Ductility is important and where heavy sections of solder are to be subjected to pull the tensile strength of the solder the results of a tensile test with the strength of a soldered may be of significance. It is rather difficult to connect the results of a tensile test with the strength of a soldered joint.

Hardness and specific gravity are not important although it has been our experience that hard solders are not to be used in work which is subject to vibration. The hard solders as a rule crystallize with a large grain and the resulting joints are frequently weaker than with soft solders giving a fine grain.

2. Melting Characteristics. The actual *melting point* of the solder is of importance in connection with the material to be soldered and the strength of the soldered joint at various temperatures as well as the method of soldering. In soldering low melting point metals, we must, of course, use a low melting point solder. Frequently the metal to be soldered will stand a high temperature, but it may be in contact with materials which will be affected by high temperatures, as for example, an insulated copper wire. Frequently the metal to be soldered will withstand a high temperature without melting, but oxidizes readily, giving rise to fluxing troubles. This is the case with pure copper. High melting point solders cannot be used with a soldering iron, but require a torch or a soldering pot. The *melting range* is of importance. We may require a large melting range as with a wiping solder or we may desire a solder which will set up rapidly, which means the initial solidification and the final solidification points must be close together. *Resistance to oxidation* over a considerable range is important, especially for pot-soldering where there is a large surface of molten solder exposed to the air and where the temperature of the pot may vary over a wide range unless regulated by a thermostat. A solder which is easily oxidized must be skimmed often which means a loss of solder or often the solder becomes sluggish, requiring a higher temperature for soldering and giving imperfect joints due to occluded or dissolved oxides.

3. Soldering Characteristics. The wetting of a metal by a solder is often a matter of temperature and often a solder has been discarded as impractical since it would not wet the cold metal. Frequently a solder will be quite satisfactory in this respect if the metal to be soldered is heated somewhat. Naturally a solder which requires a heated metal for soldering slows up the soldering process and may be impractical where large masses of metal are to be soldered. The viscosity or flowing properties of the molten solder are important. Naturally the solder to be successful must flow into small spaces between the parts to be soldered and must remain there while cooling. Pure tin flows so readily that it will run out of vertical cracks. Where a solder will not flow well, it is often possible to use it by first "tinning" the parts to be soldered with the solder that is to be used. The wetting of one metal by another or by a solder is an indication of at least a tendency toward solution. While such solvent action is necessary to a limited extent, cases have been noted where solution took place to such an extent that the parts to be soldered were dissolved away by the solder. The wetting of metals by solders is tied up with the proposition of fluxes which is of sufficient importance to warrant special consideration.

Fluxes. The action of a perfect soldering flux is fairly complex. It affords a protective agent against excessive

oxidation of the metal to be soldered, removes the surface layer of oxide on the metal and frequently fluxes away the oxide impurities which may form in the solder itself, increasing its flowing powers and making a better joint. In addition to these requirements, an ideal flux should melt below the temperature at which oxidation of the metal begins and should remain until the soldering action is complete. Mention has been made above of the gap in our solders of higher melting points than pure tin, and it is interesting to note that there is a corresponding gap in our available commercial fluxes which can be used at these intermediate temperatures (400-600° C.). These temperatures are too high for any organic materials and cause the rapid volatilization of zinc or ammonium chloride, while they are too low for the successful use of borax or boric oxide. However, the following flux has been found to answer the purpose quite well. It may be applied in solid form or in aqueous solution. It has for its base a mixture of sodium and potassium chlorides. By varying the proportions of the two chlorides the melting point of the flux can be changed over a rather wide range. To this fused mixture are added zinc and ammonium chlorides which are the active fluxing agents, but which are held back from too rapid volatilization by the alkaline chlorides.

Sodium Chloride	11%
Potassium Chloride	14%
Zinc Chloride	65%
Ammonium Chloride	10%

Another similar flux which is more expensive, but which works well with a large number and variety of solders is made in the same way as the above of

Sodium Chloride	10%
Potassium Chloride	10%
Zinc Chloride	20%
Ammonium Chloride	20%
Cadmium Chloride	40%

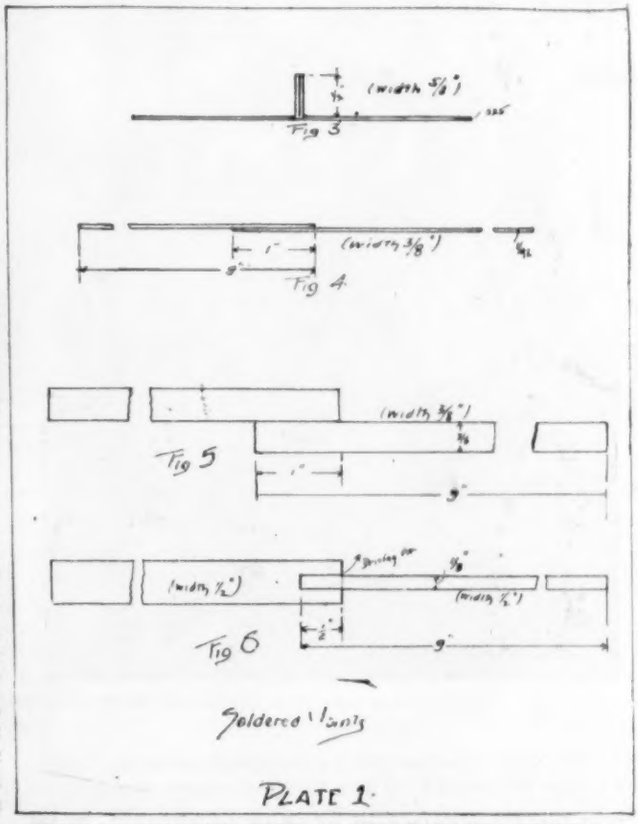
Each of these fluxes is hygroscopic and must be kept in closed receptacles.

In addition to the chemical fluxing and the melting requirements of fluxes we have other requirements for certain lines of work. For example, in complex electrical machinery where the soldered parts are rather inaccessable it is unwise to use metal chloride fluxes for the reason that these must be thoroughly removed from the soldered article, particularly if it is of copper. If even small amounts are left, the flux will pick up moisture from the air and corrosion will soon take place. In electrical machinery there are also certain kinds of insulation which may be attacked by the metal chlorides or at least a short may be established by the presence of the conducting salt.* In the manufacture of electrical machinery we are therefore limited to fluxes which do not cause corrosion of the copper even if left in excess on the work by a careless workman or through inaccessability of the soldered part. Such fluxes are rosin, rosin-alcohol, glycerin and the like. It is interesting to note that the limitations imposed on certain lines of work due to the flux also impose a limitation on the kind of solder used. There are many instances where one would desire to use other solders than the usual commercial solders containing tin, aside from the matter of cost, but a successful non-metallic salt flux has not been developed for certain solders. This is a point to be borne in mind in attempting to use tin-solder substitutes. There are certain uses where the use of tin or its alloys seems at present to be imperative.

4. Characteristics of the Soldered Joint. In a soldered joint we look for mechanical strength of the joint against strain and vibration, clean union free from oxide and one which will not corrode. In addition to these requirements there is frequently the matter of strength of the soldered joint at elevated temperatures. This is especially true in electrical machinery which may be overloaded with consequent heating of metallic parts and in machinery where heat is derived from fuel or friction. Solders differ widely in their strengths at higher temperatures. Some solders which are strong at room temperature fall off rapidly with increasing temperature, while others may hold a high percentage of their low temperature strength to a point quite close to their melting point. Illustrations of this are given in the discussion which follows later on special solders.

III. SOLDER TESTS

Having considered some of the requirements of solders we are next concerned with a method of determining how well various solders will meet these requirements. After meeting the difficulties of fluxes, methods of heating, etc., it is necessary to test the soldered joints, and it is desirable that our tests shall have a direct relation to the use to which our soldered article will be subjected. It is therefore conceivable that the tests for solders for specific purposes might be different than those for other purposes. In general the resistance of the soldered joint to a pulling force is considered a good test. It is our experience that such a test is not always an easy one to make. It is difficult to test for a pull without bringing in shearing.



SKETCH OF VARIOUS TYPES OF TEST BARS FOR SOLDERS.

In some work which was done on nearly two hundred solders we used various types of test pieces shown in Plate 1. The tests with the heavy ⅜" bars were quite uniform and probably are significant of the strength of the soldered joint, although the copper bar changed in cross section on pulling and shearing strains were un-

*See Fessenden, Insulation and Conduction, Proc. Am. Inst., E. E., V. 15, 1898, p. 148. Turner & Hobart, Insulation of Electrical Machines, p. 146.

doubtedly present. The final tests were made by soldering two copper cylinders ½" in diameter end to end, having supported them suitably at a definite distance (.02 in.) apart. The unsoldered ends were threaded and the two pieces pulled apart by direct pull.

IV. SOLDER SUBSTITUTES

From the foregoing, it will appear that the substitutes which may be used in place of tin-lead solders will depend upon the requirements of the individual case. Let us consider, first, possible substitutions for the usual half and half solder and then substitutions where the work permits of higher melting point solders.

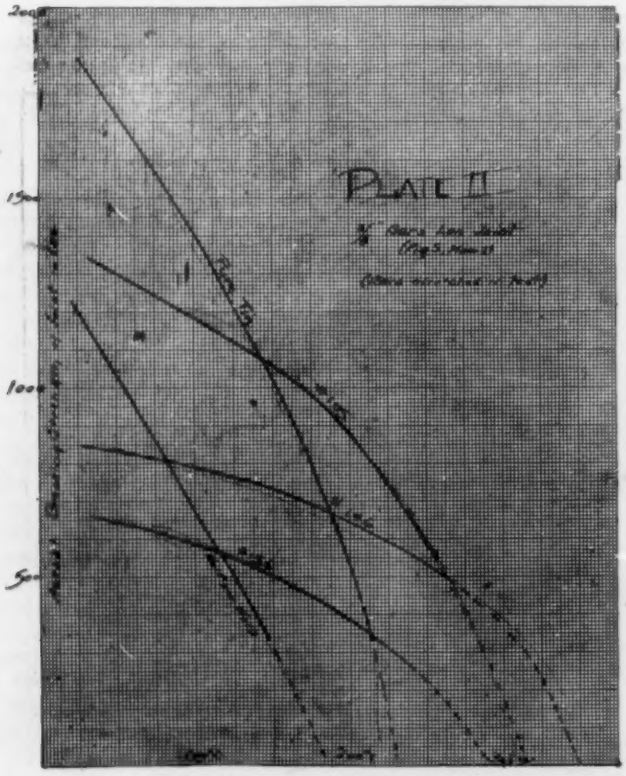
The most promising of the lower melting point solders which the writer has tried are those using lead-cadmium as a base. A very good solder for some purposes is composed of lead 90-92% and cadmium 8-10%. However, it is not suitable for general use for the reason that it oxidizes rapidly at about 300° C. (melting range 249-273° C.). A large amount of metal chloride flux is required and it is impossible to use the solder in a soldering pot.

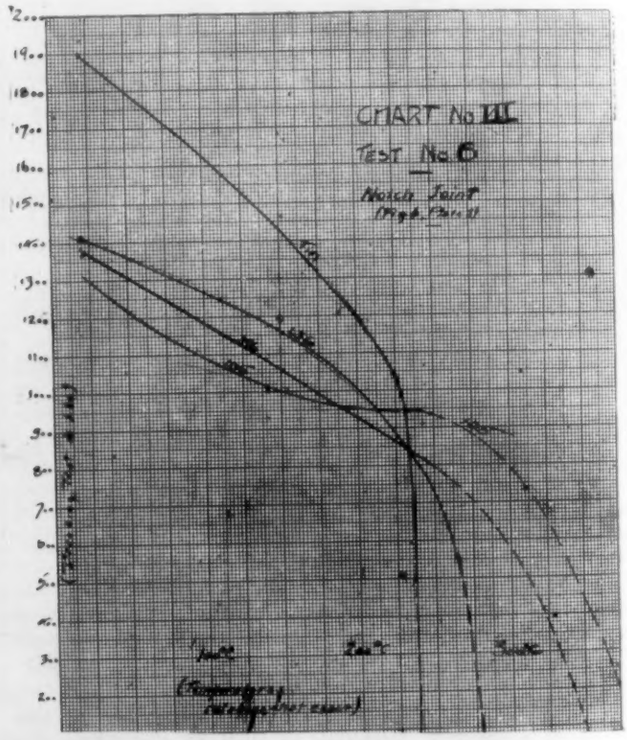
If certain metals be added to the above lead cadmium base, the tendency to oxidize is lessened and a much better solder is obtained. There are two classes of additions which we may make. We may add a metal such as tin which lowers the melting point of the solder and gives us a solder melting through the range of 180-230° C. for approximately a 10% addition of tin. The fluxing action of tin is well known and the present solder seems to be more adaptable after the addition of tin. The strength of the soldered joint is about that of half and half. Metallic chloride fluxes appear to be necessary, the one given above being very successful, while zinc chloride with rosin and alcohol gives fair results as does zinc chloride aqueous solution.

The writer has tried the addition of silver, calcium, copper, antimony, zinc, nickel, as well as tin to the lead cadmium base. These metals do not lower the melting point as does tin, but give melting ranges with small additions of not over 3% in the neighborhood of 249-300° C. Some of the soldered joints have strength equal to that of half and half. Zinc does not dissolve in the lead cadmium base in quantities much above 1%-1.5%, but successful solders have been made by adding 5 or 10% of zinc to the lead cadmium base, stirring thoroughly and pouring before segregation has taken place. When excess of zinc was allowed to rise to the top the composition of the two layers was found to be

	Lower Solder	Upper Hard Crystals
Pb	89.7	2.8
Cd	8.8	21.4
Zn	1.6	75.5
Impurities	.9	1.3

The melting range of the solder is about 235° C.-265° C. and the melting range of the eutectic is about 354-368° C.





FIGS. 2 AND 3—COMPARATIVE TESTS OF HIGH TEMPERATURE SUBSTITUTES FOR TIN AND LEAD SOLDERS.

The strengths of soldered joints (½" butt soldered) expressed in pounds per square inch of solder section of the various lead, cadmium and other metal solders were:

92% Pb, 8% Cd Metal No.	Addition to % Added	Tensile Strength Lbs. per Sq. In.	Melting Range
		8250 9250	249°—274° C.
Tin	1%	6000	.....
"	2	5600	.....
"	5	8150 8160 5100	212°—253° C.
"	10	8670 7000 5500	200°—248° C.
"	20	6750	.....
"	30	7000	.....

Zinc	1%		11000			237°—267° C.
	(Segregation above 1.6%)					
"	2.5		9000	8600		.....
"	5	12000	12000	10750	8000	(See above)
"	10		9000			.....
"	20		9500			.....
"	30		10000			.....
Silver	1.75%		8000			249°—270° C.
Copper	3.5		6500			249°—280° C.
Nickel	.1		9000			250°—300° C.
Half and Half (for comparison		9000	10400	10000		180° C.
Pure Tin	"		9250	10500		237° C.

(Temperature measured by 500° thermometer—not exact.)

It is to be noted that the strengths of the high zinc addition to the lead cadmium base were good, although there is segregation of the high zinc eutectic above 1.6%. The zinc alloys are not so soft as the tin additions.

electrical copper equipment. In the second place none of the solders show strength tests equal to those obtained by pure tin, except at elevated temperatures. However, several uses have been found for these solders where great strength was not required, as in certain spark plugs, cup connectors on copper wires, brass parts which are to be enameled and subjected to a baking temperature above that permissible with pure tin, etc. The most promising of nearly two hundred soldefs tested are

No.	Composition	M. P.
105	Zn 97.5% Ag 2% Cu 1.5%	403° C.
142	" 98 Ni 2	402° C.
146	" 97.5 " 1.0 " 1.5	407° C.
156	" 5 Pb 95	290° C.

It is obvious that none of these solders approach pure tin. They are brittle and the joints soldered with them would in all probability not withstand vibration. They are valuable on account of their high melting point and may therefore be useful in certain lines of work. They

WOMAN IN WAR WORK. FEMALE OPERATIVES DOING THEIR PART IN THE SHIPPING ROOM OF THE CHASE METAL WORKS AT WATERVILLE, CONN.

In one of the practical tests a tin can was soldered with the 5% zinc solder without the use of a flux. Various joints were soldered using copper, zinc, lead, iron, ferro manganese and other metals. It would appear that the low zinc addition or the low tin addition to the lead cadmium base would make a suitable substitution for ordinary tin-lead solders where it is permissible to use a metallic chloride flux. The zinc addition solders are fluxed by mixtures of ammonium chloride, rosin and alcohol, whereas the tin solders required zinc chlorides.

High Temperature Substitutes. It is well known that pure tin makes the best solder for temperatures somewhat above those that half and half will stand. Results of comparative tests at various temperatures are given in Plates II and III. Thin tin soldered copper joints hold quite well up to a point near the melting point of tin and then the strength drops off rapidly.

Unfortunately our efforts to find a substitute for tin when used pure as a solder for temperatures above the melting range of the lead cadmium zinc solder, have not been successful except in a degree. All of the solders which have the satisfactory melting point require metallic chloride fluxes which would rule them out for use in are extremely difficult to use on account of the increased oxidation at 400° C.

The curves given in Figs. II were made with copper strips which stretched on test. The values are relative and are not to be compared with the strengths of the butt joints. They are interesting in showing the difference in the strength of the various joints at different temperatures.

SUMMARY

After a discussion of the characteristics and requirements and methods of tests of solders the following substitutes are suggested for trial:

Melting Range	Composition
212°—253°	Pb 84.4 Cd 7.6 Sn 5.0 (May be varied)
237°—267°	Pb 90.6 Cd 7.9 Zn 1.5 " " "
235°—368°	Pb 87.5 Cd 7.5 Zn 5.0 " " "

Formulae are given for 400° solders which may be used where the soldered joint will not be subjected to excessive strain or vibration. These solders are rather different to use on account of excessive oxidation at the higher temperatures and the lack of adequate fluxes.

THE SALESMAN AS AN AID TO THE BRASS MANUFACTURER IN THE TRADE

SOME PRACTICAL SUGGESTIONS FOR CO-OPERATION

Written for THE METAL INDUSTRY BY P. W. BLAIR, MECHANICAL EDITOR.

The able and reliable salesman who regularly calls on the brass manufacturer and metal trades is a mine of information as to the requisites for success in this particular line and his advice and suggestions are of all most inestimable value to the beginner or even to one of long experience.

No matter what line he is selling—foundry supplies, machines or tools, plating and polishing supplies, he is always able to give out a lot of information because of the close contact that his concern and he himself keep with the most up-to-date methods pursued by the different manufacturers throughout the country and the territory that the salesman covers every year.

It is always easier to see the shortcomings of others and how they may be avoided than to improve ourselves. Therefore, the easiest way to size ourselves up with reasonable exactness is to secure the frank opinion of one who is capable and in a position to observe us. That the traveling salesman is in a position is evident and confidential relations with him are well worth cultivating. The men who are making a success in selling supplies to the brass manufacturers are the ones that are practical men in the line. They represent and can back up the statements that they make to a prospective customer by just two things—enthusiasm and a thorough knowledge of his products.

There are some subjects, however, on which the salesman is not likely to be entirely frank when talking to his customer, but on which he does not hesitate to express an opinion to others. He believes that a liking for detail and the policy "we have been manufacturing our goods under this method and formula for so many years" and a disposition to give personal attention to every matter that turns up keeps many a man and firm in the small earning class, while the actual possibilities of this particular man or concern are thousands of dollars greater.

When Mr. Salesman calls and finds the general manager sweeping the floor of his office or doing similar work that could ordinarily be as well done by others he cannot help but wonder whether circumstances really compel the personal attention to the work of this kind or whether it is due to a belief on the part of the customer that he is economizing by never hiring or have another do anything he can do himself. If on succeeding visits the salesman finds similar conditions he feels justified in classing this customer as a man of limited business qualifications and not worth special attention or warrant the liberal credit accommodations he would have asked his house to grant to the efficient customer whose business methods promised a worth while volume or orders in the future.

The leading salesmen tell me that the always busy man, the man who has little things on his mind, constantly feels that he has turned a clever trick by getting rid of the salesman with his stock excuse of "too busy to day." instead of listening to the salesman and absorbing whatever of value there might be in store. The really big purchasing agent or manager can be depended upon to take time enough to get all the information he can on all or any new article, device or method that might be of possible benefit to him, while the little fellow is satisfied with existing conditions and that is the reason why the big man is big and the little man remains little.

Someone has said that it is impossible for one to build up a competence under existing conditions by his own unaided efforts. Whether or not this is a fact and I believe that it is as it is certain that all the time absorbing matters of detail that can be turned over to others leave that much more time to work out the business building plans necessary to satisfactory progress. The intelligently direct work of as many others as can be used to advantage, place the man of ability in a position to realzie the full fruits of his training and experience. Life is short at best and there are so many persons who are able to attend to details that it is a positive loss to any calling when one of executive ability in his line falls short of his opportunities let alone the loss to the individual himself.

The writer recalls a certain man in a small town in Illinois who ran a little plating shop and who finally woke up to his deficiencies and is now on the high road to success. The most or majority of his work came from a manufacturer of metal goods in the same town. For several years this man was practically an employee for the metal goods manufacturer, attending to all the details of the actual plating as well as deliveries, etc. He did not even have time to become properly acquainted with his own family and all waking hours were working hours for him. When he finally decided to get away from the slavery of detail he moved to larger quarters, installed a comfortable chair beside a modern desk, employed a stenographer and connected a bell signal with his workrooms.

He made it a point to stick to his desk ready to meet all callers and at the same time to be in constant touch with his production and deliveries. He found that there was a great difference and that he could, under the new rule, devote all of his time to important matters and that his employees and so forth came to the employer instead of the employer going to the employed. His business has prospered so greatly in the few years of his new regime or system that he has several times been forced to increase the size of his workrooms and force of employees and instead of depending entirely on one manufacturer he has contracts for plating covering a wide area of territory, including many of the most desirable customers.

If proof were needed the man has proven that intelligent idleness pays.

THE SOULS OF CORPORATIONS.

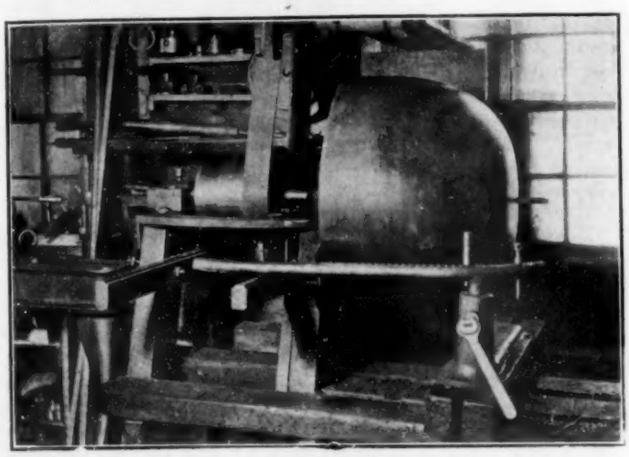
There is an old axiom of English law that corporations have no souls. The manner in which thousands of corporations have given their services and their means to the Liberty loan, to the Red Cross, and to the Y. M. C. A., and to other national efforts during this war seems to disprove the truth of the saying.

The Congress of the United States seems to have adopted the view that a corporation may have a soul, since it has authorized national banks to contribute to the American National Red Cross out of any net profits available under the law for the declaration of dividends. The law further provides that funds so contributed shall be used by the Red Cross in furnishing voluntary aid to the sick and wounded of the combatant armies, the voluntary relief of the Army and Navy of the United States, and the relief of the suffering caused by the war to the people of the Allies.

THE MANUFACTURE OF METAL TYMPANI

A Brief Article Regarding Kettle Drums Used in the Army

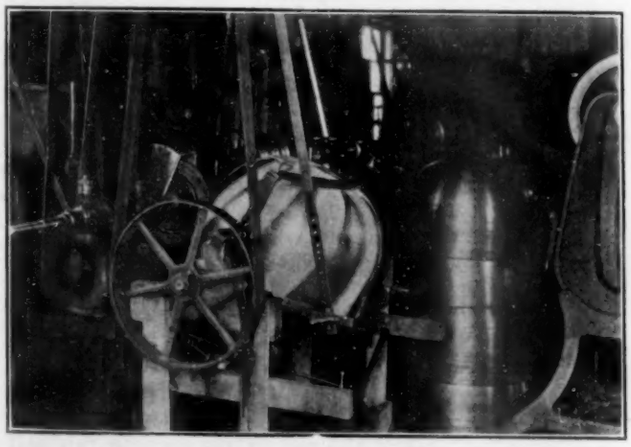
At a little shop in Geneva, N. Y., filled with machinery of his own manufacture, John J. Pole is busily engaged in turning out the tympani or kettle drums for the United States Army. Probably the most interesting fact about this little shop, which is not more than 15 by 30 feet in size and contains three thousand dollars' worth of machinery, is that Mr. Pole has sent out from it in the last thirty years more than four hundred sets of tympani to all parts of the globe.



SPINNING A COPPER DRUM FOR A TYMPANUM

THE COMPLETED TYMPANI

Handicapped with small means and a lack of room what Mr. Pole has accomplished is a little short of marvelous. The machinery shown in the cuts illustrates his ingenuity and is a striking proof of the adage that "necessity is the mother of invention." Particular attention may be directed to the automatic polishing machine which Mr. Pole designed and built himself and which is adapted for the different sizes of tympani, which run from twenty to twenty-eight inches in variations of two inches.



A HOME-MADE AUTOMATIC POLISHING MACHINE FOR TYMPANI

Another instance of Mr. Pole's capability as a mechanic is shown in the sheet metal fittings now used on the kettles to hold the nuts for the hand-screws to work in. They were previously made of malleable iron, but being unable to obtain these he designed his own tools and now makes them this way, and he states that they are neater, stronger, lighter and better in every way. A novel substitute has been found for making the sticks or hammers in that he employs old buggy spokes, as the hickory formerly used is not obtainable.

In the manufacture of the tympani itself the following operations are made use of: The drum is made of spun copper, ⅛ of an inch in thickness and 38 inches in diameter. It takes about two weeks to manufacture one. The top is of calfskin.

HOW THE TYMPANI ARE USED IN THE CAVALRY

The copper comes in flat sheets. The secret of the drum is in the spinning. The flat sheet if held to a form and spun at the speed necessary would result in the hole through which it is held gradually enlarging and finally splitting the sheet. Mr. Pole first places the sheet on a flash with a hollow center. The sheet is placed aginst the metal form and as the sheet spins it is gradually formed. There are several stages, the last resulting in the completed form.

Mr. Pole is the holder of a silver medal given him at the Panama Exposition. The medal was granted after an examination and test of the instruments, although Mr. Pole was not present.

In the cavalry bands the tympani hang about the necks of the horse and are beaten by the mounted drummers. The drums are made in pairs so that they will match.

The process of making the instruments is slow and laborious and as the output is small Mr. Pole has never earned great wealth from his skill in making these instruments, but he declares that he is satisfied. He earns sufficient through his own efforts and has enjoyed life and raised a large family. In musical circles he is known throughout the world and today he is furnishing all the drums that Uncle Sam desires for his bands. The satisfaction of knowing that it is his instruments that not only sound the cheering music of the camps but also the thrilling music of the battle recompenses Mr. Pole for the monetary compensation, which would ordinarily come to the inventor of a device used throughout the entire world.

NITRE CAKE FOR PICKLING METAL

How a Practical Man Eliminates Sulphuric Acid

Written for The Metal Industry by George P. Butler, Foreman Dominion Chain Company, Niagara Falls, Canada.

This short article has been written at the request of The Metal Industry for some data as to my experience with the use of nitre cake as a pickling substitute for sulphuric acid. I will endeavor to tell how the material is used and word the article just as if I was talking to a foreman, having charge of the pickling department.

Where there is considerable pickling to do I would suggest the use of a tank about 10 feet long, 3 feet wide and 18 inches deep, having a water tap in one corner and a steam pipe in the center, about 3 inches from the sides and 6 inches from the bottom of the tank. A rinsing tank fitted up with a water tap and steam pipe should be situated at one end of the pickle tank and the water in this tank heated to the boiling point. Most pickling plants have two rinsing tanks—cold and hot—but this is not necessary where nitre cake is used.

The pickle tank should be filled three-fourths with water and one round of nitre cake to each gallon of water added. The nitre cake comes in barrels, so the barrels can be placed close to the tank and the cake thrown in by hand. Nitre cake does not injure the hands in the least. Now turn on the steam and allow it to heat to 140 degrees Fahr. and see that it stands about 8 degrees Baume'. At this heat no unpleasant fumes are thrown off which will affect the workman.

Now place the articles to be pickled in the solution and if they are drop forgings, flat steel coils for stamping, or other articles with the usual heavy scale, they will be ready to remove in twenty or thirty minutes. Dip the articles then in the rinsing water, which should, as mentioned, be very hot. Load up the pickling tank again and turn on the steam for a few minutes. Always keep the solution at about 140 degrees Fahr., and in order to do this, the steam should be turned on each time the tank is loaded. A tank full of articles should be turned out about every half hour during the day. Do not allow the tank to remain empty during the noon hour, but just before the whistle blows fill up, and there will be a batch ready to take out at 1 o'clock.

If you have "carried on" every half hour during the forenoon it will be necessary to add more cake to the solution at 1 o'clock because turning on the steam so frequently has added some water. The addition of ½ pound per gallon will enable you to carry on during the afternoon. Before the whistle blows in the evening fill up the tank with the articles as before and let it stand all night and in the morning you will find the work nicely pickled and ready to rinse off.

If the solution has been on the hustle all day, the next morning clean out the tank and make up a new pickle for, with the present high cost of labor there is sure to be a loss in running a slow dirty solution. If a sewer is connected with the tank, and there should be, it will take but a few minutes to clean out the tank and fill up with clean water.

For a tinning plant where the work going through is bright tumbled, make up the nitre pickle with 1 pound of the nitre cake to a gallon of water and heat to 120 degress Fahr. A five minutes' immersion of the articles will be sufficient.

Nitre cake pickles our work, which is saddlery hardware, better than a 30 per cent. hydrofuoric acid, which we formerly used, especially just now when labor is so high and there is such a feverish hustle to get work out.

Nitre cake placed in malleable foundry water barrels, should prove a gold mine. This particularly is true where the work coming from the annealing pot has a hard tough scale. In this plant we pickle a considerable amount of band coils, ½ to 5 inches wide for stampings, drop forgings, etc.

When sulphuric acid was used for pickling our labor cost was thirty cents per hundred pounds, but to-day with nitre cake the costs are around seven cents per hundred pounds and about ninety per cent of the nastiness and danger of sulphuric acid from its fumes has been eliminated.

It is a pleasure to see the work hustled out as fast as a man can truck it away, whereas formerly the very thought of having to get work out of the pickle house filled our soul with aches and pains. We are making progress. It has been said that the largest room in the world is the "room for improvement" and it has also been written that "there is no finality to anything."

SOLDIER INSURANCE.

"I rejoice with you and our heroic men on this just and humane provision the generous American people have made for them and I am proud to have the Treasury Department administer this great law. Please congratulate the men of your gallant force for me on the wisdom they have shown in taking the benefits of the insurance law, and congratulate them particularly for me on the glorious work they are doing on the desecrated soil of noble France for suffering humanity and world freedom. Every American heart is thrilled" by the valor and achievements of our splendid sons. (Secretary McAdoo's cable to Gen. Pershing.)

EDITORIAL

Vol. 16 New York, September, 1918 No. 9

THE METAL INDUSTRY

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CONTENTS

	Page
The Foundrymen's Convention	395
Some Notes on Babbitt and Babbitted Bearings	402
Elements of Electro-Chemistry (Continued)	405
Government Specifications for Copper and Nickel Plating	407
War Effort of the Midlands	408
Lead Plating (Continued)	410
Solders and Substitutes for Lead-Tin Solders	412
The Salesman as an Aid to the Brass Manufacturer in the Trade	416
The Manufacture of Metal Tympani	417
Nitre Cake for Pickling Metal	418
Editorials:	
Fourth Liberty Loan	419
The Foundrymen's Convention	420
Correspondence and Discussion:	
Misrepresentation by Electro-Platers	420
Substitute for Tin	421
New Book:	
The Journal of the Institute of Metals	421
Shop Problems	422
Patents	424
Equipment:	
New Metal Ingot Mold	426
Hausfeld Non-Crucible Melting Furnace	427
The New All-Steel Work Stand	428
Crane Company's New Montreal Plant	428
Furnace Cement	428
Associations and Societies	429
Personals	429
Metal Men in the Service	430
Trade News	431
Metal Market Review	439
Metal Prices	441
Supply Prices	444

FOURTH LIBERTY LOAN

THIS IS YOUR CHANCE!

Although the United States has extended the age limits for military service and purposes to raise an army of 5,000,000 men, the average citizen's real opportunity to participate in war work must be along one line—the contribution of cash. For military service, certain qualifications are essential. For this other service, only one qualification is needed—the ability to work hard at one's regular occupation, and to set aside regularly a proportion of earnings to lend to the Government.

The Government needs money to finance its vast war programme, just as much as it needs soldiers. Without funds, the expeditionary forces must be helpless. If the Government could not dispose of its Liberty Bonds, it would be unable to feed and clothe its armies, and to supply them with guns and shell and all the material of war. Lacking these things, the soldiers on the West front would have to slow up their victorious drive, and the final conquest of the Central Powers would be postponed indefinitely.

The importance of the part we at home play in the winning of the war, therefore, should not be underestimated. The more money the Treasury Department has at its disposal, the more war material it can buy and the more troops abroad can expand.

The more Liberty Bonds we buy, the more shell our men will have to defeat the Germans. Our purchasing power will tell the tale. That purchasing power may be increased if we increase our efforts. More work, harder work, longer hours, will produce more wages, and incidentally will turn out more material which, directly or indirectly, must help the country in its war activities.

War-time saving has to be directed to a definite end —the accumulation of money to lend to the Government. If each man does that, he may have the satisfaction of knowing that he is playing his part in the great war thoroughly and satisfactorily.

If each good American buys Liberty Bonds of the Fourth Liberty Loan, with every cent of surplus he can scrape together, he will back up the boys over there, and enable the United States to make its full contribution to the liberation of mankind from the menace of Kaiserism.

HOW THE EMPLOYER CAN HELP

On pages 8 and 9 of this issue of THE METAL INDUSTRY we publish the announcement of a plan in which under an organized method the co-operation of every employer is requested in order to help in the promotion of the Fourth Liberty Loan, the drive for which extends from September 28 to October 19, 1918. That announcement is worthy of your careful and immediate attention and ACTION.

It is certainly not difficult to see how the energetic

carrying out of this plan may produce results helpful not only to the Liberty Loan but to American business.

The tremendous impetus which Charles M. Schwab has given to shipbuilding has been largely achieved by making every individual engaged in the industry feel a personal responsibility for results and a personal pride in helping to make great results possible.

This spirit of accomplishment in the ship-building industry has been brought about by the leaders—the employers—the bosses; whatever you choose to call them; making it a business to come in personal contact with the workers and to inspire and enthuse the men with a sense of the importance of their work for victory in the war—a sense of personal responsibility, and a spirit of teamwork.

The creation of that spirit among the workers of the nation in ALL lines of activity would be of incalculable benefit to the workers themselves, to employers, and to the nation.

Concretely two of these results would be:

1. To quicken and increase the response to all war measures such as Liberty Loans—War Savings Stamps —the draft—food and fuel saving.

2. It would make the worker feel more keenly his responsibility to do his work (no matter what its character) to the very best of his ability. Make him feel the necessity of sticking closely to his job.

Employers generally should pursue with intelligent enthusiasm the plan of "Win-the-War" meetings proposed as a means to aiding the rapid flotation of the Fourth Liberty Loan. The results of such action will not only be helpful in the Loan drive, they will be permanently helpful to the nation through the development of a keener realization by the worker of the importance and dignity of his individual job and the necessity for personal responsibility and helpful teamwork.

EVERY employer can be a leader and a center of influence in this work.

The man who operates a small business with relatively few employees may feel that HIS circle of influence is too small to be worthy of any effort. That is a mistake. It is the AGGREGATE that counts, as the announcement of the plan very clearly points out.

The man who is in a relatively small circle may not hold so pretentious a meeting—it may not be formal or run under parliamentary rules—it may not be especially announced, or accompanied by music and oratory. But the man who will quietly call a dozen employees around him and informally, thoughtfully, lead discussion into win-the-war channels, pointing out the importance to the individual of doing his best in support of Liberty Loans and all other war actitvities, can do a real service in this way. It can be so well done in no other way. And ten thousand such little meetings would produce an enormous aggregate result.

Whether his opportunity be great or small every American business man should carry out this idea in a definite, systematic manner. The "Program" booklet which is mentioned in the announcement will be found tremendously helpful in its suggestions as to what should be done under any circumstances.

THE FOUNDRYMEN'S CONVENTION

As told in the opening pages of this issue of THE METAL INDUSTRY, the attention of the metal industry of the country will center in Milwaukee, Wisconsin, October 7 to 11, 1918. With the entire United States busily engaged in the gigantic task of winning the war, the opportunity to visit Milwaukee and see what is new and best in foundry lore should be welcomed by all in the metal business.

The reports from Milwaukee that 5,000 or more visitors are expected and the list of exhibitors which show a larger number than ever before bear out the claims that the convention and exhibition will be larger and better than those that have passed into history. This year for the first time the Iron and Steel Section of the American Institute of Mining Engineers will meet in Milwaukee. The American Institute of Metals, now the Metals Section of the same society, will also hold their meetings under the new regime and a fine programme is promised for the meetings of the section. All aboard for Milwaukee!

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

MISREPRESENTATION BY PLATERS?

To the Editor of THE METAL INDUSTRY:

My attention has recently been called to a condition that I feel needs the immediate attention of the foreman plater and manufacturer. This is the practice of claiming membership in the American Electro-Platers' Society by a certain class of incompetent individuals when applying for employment.

This condition has caused several manufacturers to lose confidence in the American Electro-Platers' Society because the men employed upon the strength of their claiming membership in this society were utterly incompetent.

In view of this condition I would suggest to the employer that any individual claiming membership in the American Electro-Platers' Society be requested to produce his membership card, showing him to be a member in good standing. If he cannot produce this card he should be considered as an imposter.

Another way to avoid this condition and protect the manufacturer and the reputation of the society is that the manufacturer get in touch with the secretary of the branch society or with the supreme secretary when in need of a competent foreman plater.

It might be well for the supreme body to furnish each active foreman plater with a certificate to frame and hang in his plating room.

The writer was one of the original fourteen men who organized this society back in 1909. Our object at that time was to educate the foreman plater. How well we have succeeded is shown by the number of technical papers prepared by the members and the number of chemical laboratories throughout the country that belong and are patronized by the members of the various branches.

When I reflect upon the limited knowledge of the foreman plater before the advent of this society I note the great strides he has made since its formation. I feel that every effort should be made by the manufacturer and foreman to uphold the standard we are trying to set and to improve it.

I have been taken to task for my views and attitude in regard to applicants for membership in this society, it being claimed that I was trying to make the society too exclusive. Perhaps this is true and the condition just mentioned shows this is necessary.

The New York Branch is making every effort to maintain a high standard among its members. Our motto is: "Quality and not quantity in our membership." Therefore the New York Branch is subjecting each applicant to a rigid examination as to his experience and qualifications as a practical foreman plater, and his executive ability and character have to be vouched for by his employers.

We want the employer to know that when he employs a man from the New York Branch of the American Electro-Platers' Society he is getting a man above the average in intelligence and whose ability as a foreman plater has been vouched for and investigated.

While we are doing all we can to set a standard we must have the support of the employer. A case which recently came to my attention may prove interesting here. I was requested to visit the superintendent of a large manufacturing concern with a view to help him out of his difficulties in the plating department. I found the nickel peeling, copper blistering and the finishes entirely satisfactory. The superintendent mentioned that he had had seven platers in as many weeks (where he got them from in these times I do not know). Each individual had his own ideas as to the means of overcoming the difficulties, with the result that matters became worse.

When asked why he did not employ a competent man he claimed that he had no respect for the plater and that there was no such thing as a competent plater and they wanted too much money.

I pointed out his loss, the poor quality of work he was obtaining and also the low percentage of production among other factors. I suggested that he obtain a competent man though it cost him a little more in salary than he had been accustomed to pay an incompetent man.

The result was that when I recently called upon this same firm I was met with smiles and was informed that everything was great. That they were getting out three times the amount of production that had ever been turned out before and that overhead expenses had been cut materially.

Another case of where an incompetent foreman added a brightening agent to a silver solution after which he was unable to obtain a satisfactory deposit. As he was being pressed for production and unable to obtain satisfactory results he used the only method he knew of and that was to run the solution into the sewer and made up a new one.

Another instance where the plater, in an effort to overcome an excess of cyanide in his brass solution, added sulphuric acid, almost killing himself and helper.

We are making every effort to educate the foreman plater and if our effort is causing the manufacturer to pay a larger salary than for an incompetent man, he is being compensated for it by the quality and quantity of production obtained.

The employer has been invited, from time to time, to attend the various conventions, banquets, smokers and open meetings given by the various branches, so that he may become acquainted with the class of men composing the American Electro-Platers' Society.

In addition to this it the employer could see the foreman plater working out problems in chemistry, making analyses of his solutions and working out methods of production and finishes, often times until late at night, in the laboratories of the branches, I wonder if he would not then appreciate the value of his foreman being a member of the American Electro-Platers' Society. And in addition to this the foreman his the entire membership of both the branch and the entire society back of him.

WILLIAM VOSS,
Chairman Laboratory Committee,
of New York Branch.
American Electro-Platers' Society.

NEW YORK, N. Y., August 30, 1918.

SUBSTITUTE FOR TIN

To the Editor of THE METAL INDUSTRY:

I notice in your August issue, page 372, problem 2604, an inquiry for a substitute for tin in brass or bronze for valve bodies.

Your answer does not bring out the possible use of magnesium for this purpose. This is a comparatively new use for magnesium, and while it is not a substitute for tin in all particulars, yet it is very effective in producing a dense metal free from oxides and blow holes.

The amount of magnesium used in this work varies from 0.05% to 0.1%, that is 1 pound of magnesium will deoxidize from 1,000 to 2,000 lbs. of brass or bronze.

While the principal action of magnesium is to deoxidize, it has the additional effect of making a denser casting and a stronger metal.

It is introduced into the mixture after the brass or bronze has been removed from the fire and is plunged by means of iron tongs or a "phosphorizer." Slow stirring should be continued after the metal has melted from the tongs, to insure a uniform mixture, and to give the oxide of magnesium an opportunity to rise to the surface.

Magnesium also makes a more fluid metal, so that more difficult castings can be poured than without its use. Its deoxidizing qualities also eliminate the necessity for phosphorus.

As a number of firms that I am familiar with are using this and are getting a very small percentage of lost castings, I am writing this letter with the hopes that it may prove of interest and value to some of your subscribers.

SHAWINIGAN ELECTRO METALS CO.
By D. P. Falconer, Sales Agent.

Cleveland, Ohio., August 23, 1918.

NEW BOOKS

The journal of the Institute of Metals. Volume XIX. Edited by G. Shaw Scott, M. Sc. Published by the Institute of Metals, 36 Victoria Street, London, S. W. England. Price $5.00.

Notwithstanding the war, which makes it difficult both to secure and to publish much original scientific matter, the Editor of the Journal of the Institute of Metals has been able to bring out, strictly to time, the new half-yearly volume of the Journal.

If the papers contained in the latest issue were useful—as was generally admitted when presented at the recent annual meeting of the Institute—their utility has been still further increased by the very numerous original communications upon each paper that are now published for the first time.

Pride of place in this respect is easily taken by the paper—in itself a novelty seeing that it is the first to be presented by a lady metallurgist—contributed jointly by the new President, Professor Carpenter, F. R. S., and Miss C. F. Elam, on "An Investigation on Unsound Castings of Admiralty Bronze (88:10:2); Its Cause and the Remedy." Here the printed discussion covers 46 pages, or more than twice as much space as does the original paper—an eloquent testimony to the interest created by an exceedingly practical and suggestive piece of work. In the case, too, of Messrs. Rix and Whitaker's paper on "Aluminum Bronze Die Castings," the discussion is much longer than is the paper upon which it is based, the subject being one of the greatest topical interest to engineers and metallurgists. Other valuable papers included in the present volume are those by Mr. Greenwood M. Sc., on "The Relationship between Hardness and Constitution in the Copper rich Aluminum-Copper Alloys;" by Dr. Gulliver "On Grain Size;" by Mr. Ellis, M. Sc., on "Lead-Tin-Antimony Alloys," and by Mr. R. J. Anderson, B. Sc., "On the Annealing of Aluminum."

The Presidential address—prefaced by an excellent portrait of Professor Carpenter—appears in print for the first time as does a record list of names of 107 new members and six students, which brings the Institute's membership to practically 1,000, and that, appropriately enough, in the tenth year of its existence.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ALLOYING

Q.—We are making a specialty of "bronze acid resisting chains." Will you kindly inform us through your magazine of a good formula for making acid resisting metal of high tensile strength?

A.—None of the ordinary high lead bronzes that are commonly used for acid resisting purposes are of high tensile strength.

Manganese bronze has been found very satisfactory for trays, hooks, etc., for pickling tanks. It has high tensile strength and great ductility. Its low melting point and excellent casting qualities should fit it very well for the purpose you have in mind, viz., the casing of chains. If the chains are made sufficiently heavy they ought to last for several years in the ordinary sulphuric acid pickling solutions.

A high grade of manganese bronze ingot should be obtained for the chain work and frequent tests made of the chains. Any lack of ductility in the metal would make the chains unreliable.—J. L. J. Problem 2,613.

CASTING

Q.—We understand that large concerns are casting the end rings on a motor rotor instead of soldering and riveting them on. Can you give us some information on the casting method used?

A.—For a number of years makers of electrical machinery in England and France have been casting the end rings of induction rotors from white metal, the alloy known as No. 12 being generally used. This alloy consists of 93 parts of aluminum and 7 parts of copper. In some cases both the end rings and bars are cast at one pouring. The bars must be quite heavy, however, to assure running. Some firms for this reason use rolled aluminum bars which are much lighter.

In the United States, certain manufacturers have had more or less success in casting the end rings of rotors of various sizes from brass and even copper.

No special difficulty is experienced when brass is used as its melting point is much lower than that of the copper bars. First one end ring is cast, the mold being rammed up in the usual way. The gates are cut off and then the other end ring cast.

When copper is used, securing satisfactory rotors is more difficult. Unless the copper is quite hot it will not unite with the copper bars so that a poor electrical contact is obtained and the rotor is weak mechanically. If the copper is too hot the bars are melted off. By the use of an optical pyrometer consistent results may be had. A further difficulty where the bars are rather heavy and the rings light is the cracking of the rings as the bars are drawn in by the shrinkage of the metal setting in the rings. This is overcome by tapering the ends of the copper bars so that they may be drawn in more readily.

After a brass foundry has obtained the necessary experience, rotors can be made very rapidly by the above method. Other methods are being devised that are just as satisfactory and cheaper.—J. L. J. Problem 2,614.

CLEANING

Q.—We have a process that requires the cleaning of scrap copper wire, such as is taken off of electrical machinery, and preparing it for use as anodes for an electro-chemical process. The wire is of all gauges, from hair fineness up, and the magnet wire gives us the most trouble, for it contains the insulation, cotton thread, silk and tape.

We have been burning off this insulation, but the oxide formed, along with the charred materials sticking to the wire, does not give us anything like a uniform reduction of the anode.

A.—Scrap copper wire containing insulating material of fairly heavy gauge may be treated by burning the insulation off in a closed muffle as in an annealing furnace, care being taken that an excess of air is not allowed to enter so that the metal will become oxidized, but a better way to handle the fine material is to put it with other copper-bearing material that is to be refined in a reverberatory or blast furnace. Otherwise, the metal being so fine, it will be oxidized to dust and lost.

If you are not equipped to handle the fine wire in a reverberatory furnace, it would be better not to use it at all, but make your anodes from heavier stock.—K. Problem 2,615.

COLORING

Q.—We have a requirement which calls for a lustreless metal which will be dull in color through the body of the metal as well as the surface. Our nearest approach to our requirements at the present is zinc, but we desire to eliminate even the light lustre of zinc and if possible introduce a brown shade into the body of the metal.

We have an impression that arsenic has been used to produce shades of color in body of metal. We do not refer to surface stains or oxidizing effects. The metal must be non-ferrous as well as somewhere near zinc in cost and stiffness.

A.—We are not familiar with any commercial alloys of arsenic and zinc. Antimony, however, has been used in many white brass alloys. These alloys consist of zinc, tin, copper and antimony and they have commonly been used as anti-friction metals. An alloy of zinc 94 per cent., copper 6 per cent. has also been used as an anti-friction metal. It is hard, cheap and dull in color.

The alloy of copper 50 and antimony 50 which is much used as a hardening alloy for introducing small amounts of copper and antimony into alloys, has a beautiful purple color, but it is too brittle to be of value for the purpose of making castings.

It is suggested that you select a zinc base alloy that meets your requirements most nearly and then use the sand blast on your castings to remove the lustre.—J. L. J. Problem 2,616.

DEPOSITING

Q.—Can you tell us whether or not it is possible to deposit tin in the same manner that silver is deposited in a plating bath? The metal which we would like to plate with the tin is pure zinc.

A.—The following formula is suggested for a tin-plating bath:

Tin chloride	4 ounces
Caustic soda	10 ounces
Glucose (corn syrup)	8 ounces
Water	1 gallon

Use this solution at one hundred degrees Fahr. As a tin solution does not replenish very well from the anode, it is necessary to add tin chloride from time to time to be sure to have plenty of metal in the solution.—H. B. G. Problem 2,617.

DIPPING

Q.—We have some bronze medals to be restored which have been through a fire; they are partially covered with a black scale which we have been unable to remove. We have tried hot potash and acid dip without any success. Would the scale be caused by the lead in the alloy coming to the surface under the intense heat?

A.—We believe that the scale on the bronze medals is copper oxide. A solution of one part of sulphuric acid to ten parts of water, heated to 120 degrees Fahr., should remove the scale. The medals may then be acid dipped in a mixture of equal parts of sulphuric and nitric acids to bring up the uniform color.—C. H. P. Problem 2,618.

LETTERING

Q.—Can you advise us how the lettering is done on the nickel plated brass plates as per sample? We thought at first this was done by a chemical process and a rubber stamp, but we now find that this will work on steel and iron, but not on brass. Could it be done by a sand-blast operation?

A.—To produce satisfactory results upon brass that is nickel plated the brass would have to be etched first, unless there is an unusually heavy deposit of nickel on the brass. It would seem to us that sand blasting would give you the desired results, providing a stencil is obtained that will protect the plain surface from the action of the sand.

Soft rubber stencils are frequently used, the imprint desired being cut out so that the sand can reach the metal. The resulting letters would be in matt finish, which would contrast with the remaining surface in bright nickel finish.—C. H. P. Problem 2,619.

MELTING

Q.—We find in our mill casting shop that we keep getting iron into our metal until it runs up to .14. We are not allowed over .05. Is there anything that can be used for removing this iron that is not too expensive?

A.—The iron, as it occurs in your metal, is probably held in solution, and it would require a tedious and expensive process to attempt to flux it out. While this can be done by the use of a flux made up of borax and sodium carbonate, the action of this flux on the walls of the crucibles would be disastrous, so you would lose one way while you gain in another.

What we would advise doing is to make a thorough examination of whatever scrap is used. For instance, carefully examine every bit of sheet metal scrap for brass-plated iron or steel. Carefully run through a magnetic separator, two or three times if necessary, all chips or drillings. Coat the ends of stirring bars with a mixture of fire clay and graphite kneaded into a dough and then baked on the end of the stir bar. Or better yet, use a graphite stir bar, which, by the way, if not handled very carefully, will prove expensive.

Be careful about the content of the iron in the spelter used, as this is one of the most prolific sources for the introduction of iron in the solution form.

If your iron should happen to occur in the brass in fine particles held in suspension, the elimination could be accomplished by holding the pot of metal at near its boiling point for a few minutes, and careful skimming before pouring should catch all the floating particles of iron from the top of the metal. Very likely the high percentage of iron is due to its introduction by means of scrap and spelter.—K. Problem 2,620.

OXIDIZING

Q.—We have a quantity of mixed gun-metal and phosphor bronze swarf, and are very anxious to eliminate the phosphorus, which spoils the metal for castings, owing to the presence of zinc in the gun metal.

A.—The elimination of phosphorus from the phosphor bronze swarf is not possible without losing some of the tin and copper also. By exposing the molten metal to the oxidizing action of the atmosphere for some time, much of the phosphorus would be oxidized, but the addition of a little nitre would greatly expedite its expulsion. The slag formed would, however, contain copper and tin, and should, if much of it were produced, be sold to a smelter.—W. T. F. Problem 2,621.

PLATING

Q.—Can you advise the receipt for the Rock Island method of producing black nickel, such as the government calls for on army buttons? Also, how can a yellow background be produced on sterling silver?

A.—The Rock Island formula used for plating metal products for the army is composed of the following materials, which are based on a 100-gallon solution:

No. 1. In 50 gallons of hot water dissolve 31¼ pounds of double nickel salts.

No. 2. In 5 gallons of water dissolve 6 pounds of zinc sulphate, then mix with No. 1.

No. 3. In 15 gallons of boiling water dissolve 30 pounds of carbonate of ammonia and dissolve therein 4 pounds of powdered white arsenic; add slowly, with constant stirring. When cool mix with Nos. 1 and 2.

No. 4. In 30 gallons of warm water dissolve 18 pounds of sodium cyanide and mix with Nos. 1, 2 and 3.

Use 1 to 2 volts for a still solution, but for barrel plating 5 to 6 volts are required. All articles made from iron must be previously heavily copper plated.

When the above formula is simmered down, the actual materials per gallon of solution are:

Water	1	gallon
Double nickel salts	5	ounces
Zinc sulphate	1	ounce
Ammonium carbonate	4½	ounces
White arsenic	¾	ounce
Sodium cyanide	3	ounces

In finishing military buttons the method is different, and we would refer you to the article in the November, 1917, issue of THE METAL INDUSTRY by Charles H. Proctor, which gives the necessary information.

A yellow background may be produced on sterling silver by using a solution of iodide of potassium or a solution composed of equal parts of chloride of iron and water. Use the solution warm and scratch-brush the silver surfaces and color with a dry-scratch brush. An enamel may also be used for the same purpose as outlined in the November article.—C. H. P. Problem 2,622.

REDUCING

Q.—We have a two thousand pound capacity reverberatory furnace that we have built for the purpose of reducing lead battery plates which we are unable to reduce. The clear lead runs free, but when we reach the oxide it refuses to reduce. This is no doubt due to the sulphate it contains.

We have used charcoal, marble dust, lime and salt cake with no results. Would you please advise us what kind of fluxes and what kind of reducing agent we need, as commonly used to reclaim the lead from battery plates.

A.—Lead battery plates scrap usually contain metallic lead, lead oxide and lead peroxide. Some antimony is usually present also. From its nature this material is very highly oxidizing and hence difficulty is encountered reducing it. It may be sweated in a reverberatory furnace, no fluxes whatever being added and no reducing agent. The residue of oxide which is rich in lead is scraped from the furnace through the side doors. It is generally mixed with tin slags and smelted in a lead blast furnace with the addition of tin plate scrap. The material recovered is a lead-tin alloy which may run from 10 per cent. of tin upward, depending upon the character of the charge.

A reverberatory furnace could be used for the last operation provided the charge is not very refractory. It has the advantage that less lead is lost by volatilization due to the lower temperature. The blast furnace is generally used for such work, however, as its output is so much greater."—J. L. J. Problem 2,623.

STRIPPING

Q.—How can I remove mercury from old silverware which I wish to replate?

A.—Mercury volatilizes at 660 degrees Fahr., and if the articles you wish to replate in silver will stand this degree of temperature it will evaporate in the atmosphere, otherwise you will have to use mechanical methods for removing it. Mercury deposits by simple immersion on many metals, so it is difficult to prepare a dip or electro-strip for the purpose.

You might, however, try an electro-strip made up on the basis of 8 ounces of nitric acid to 1 gallon of water. Use lead as the cathodes and the articles the anodes; or, in other words, arrange the strip just the reverse to a plating solution. Use a fairly strong current.—C. H. P. Problem 2,624.

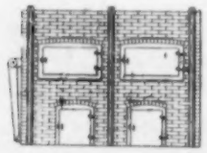
PATENTS

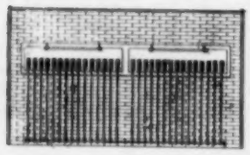
A REVIEW OF CURRENT PATENTS OF INTEREST

1,269,973. June 18, 1918. **Wire-Annealing Furnace.** John Cook St. Clair, Johnstown, Pa.

This is an improved form of furnace designed for the annealing of wire. The patent covers the following claims:

In a wire annealing furnace, shown in cut, having an opening in one wall, a sheave supported on a jointed arm adapted to be withdrawn or placed into the furnace chamber through said opening, a wall of the furnace chamber being provided with a perforation through which the wire is drawn from the furnace, and means coacting with the portion of the arm inserted within the furnace chamber for maintaining the sheave carried thereby out of contact with the floor of the furnace chamber.

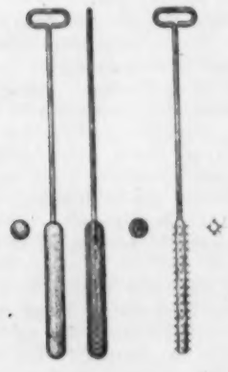




In a wire annealing furnace having openings in a wall of the furnace chamber, a series of sheaves supported on jointed arms adapted to be individually withdrawn or placed into the furnace chamber through said openings, and perforations in a wall of the furnace chamber through which the wire is withdrawn from the furnace chamber.

1,270,583. June 25, 1918. **Stirrer for Molten Mass Mixtures.** Frank D. Zinno, of Waterbury, Connecticut, assignor to Waterbury Mfg. Co., of Waterbury, Connecticut, a corporation.

Heretofore molten brass mixtures have generally been stirred by iron or steel stirrers. This practice has always been open to the objection that the surfaces of the stirrers become oxidized and scale off into the brass, whereby the same is injured since it is well known that the presence of the smallest amounts of iron in brass is capable of detection and is objectionable and renders it unfit for many uses.



The object of this invention is to avoid this objection by keeping the brass free from contamination by the stirrers employed in the casting process.

As shown in the cut a long cylindrical brass core is furnished with a plurality of regularly spaced radial retaining-points upon the lower end of a rigid handle of iron or steel having a loop at its upper end. As shown, the lower end of the handle is squared at the point where it enters the core, whereby the handle is prevented from turning therein. The entire core is inclosed in an envelope of highly refractory material such as asbestos, fire clay, or porcelain. The stirrer as thus constructed is used in the same manner as an ordinary iron or steel stirrer is used, only its protected core being introduced into the molten brass mixture. Now in case the refractory envelope cracks or portions of it chip off, the molten mixture may gain access to the brass core and melt a portion thereof, but no harm will then be done, since the result will merely be that a small quantity of brass will be added to the mixture which will be practically unaffected by the addition.

1,268,818. June 11, 1918. **Pickling Compound.** H. J. Crabbe, Cleveland, Ohio, assignor to Grasselli Chemical Company of the same place.

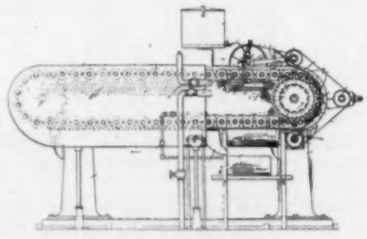
The present improvements, relating as indicated, to picking compounds, have more particular regard to a compound for use in pickling metals for the purpose of removing the scale and dirt from castings and hammered or forged articles. The usual compound used for this purpose is niter cake or salt cake, and it is one object of the present invention to provide a more effective and equally inexpensive compound.

The improved composition consists of bisulfate soda and sodium chlorid, the preferred proportions being about 100 parts of the bi-sulfate of soda to about 41 parts of the chlorid. Preferably the bi-sulfate of soda should be very finely divided. In use the compounds are dissolved in the pickling solution, producing a bath that is partly muriatic and partly sulfuric acid.

It has been found that this compound will operate more effectively than niter or salt cake on metal articles, the pickling being accomplished in shorter time, while the cost of this compound is practically the same as that of other compounds used for the same purpose.

1,271,027. July 2, 1918. **Automatic Polishing and Lacquering Machine.** John F. Gail, of Kenosha, Wisconsin, assignor to the Simmons Manufacturing Company, of Kenosha, Wisconsin, a corporation of Wisconsin.

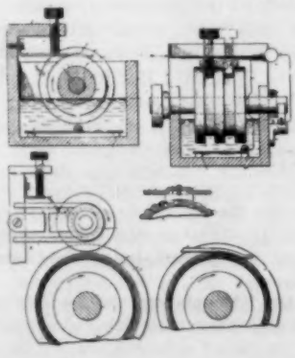
This invention relates to improvements in polishing and lacquering machines, and more particularly relates to a machine which is designed to operate upon a succession of similar articles which are automatically polished and coated without attention from the operator.



Among the salient objects of the invention are, to provide a machine, as shown in the cut, in which the objects are in turn polished, receive an application of coating material, and are then artificially dried to set the coat before the objects leave the machine; to provide a machine of the class described in which the objects are successively carried into the field of the polishing devices, from thence into the field of the coating mechanism, and thence into a heated zone before finally being ejected from the machine when dry; to provide a coating machine in which the adherent coat is applied to a succession of objects, the coated objects being then carried into a heated zone and finally cooled artificially before ejection from the machine.

1,271,136. July 2, 1918. **Process and Apparatus for Electro-Deposition Under Compression.** Edward G. Cook, of Long Island City, New York, assignor, by Mesne Assignments, to Copper Products Company, a corporation of Maine.

In the electro-deposition of metals it has been found that frequently by vagaries in the current, or unknown conditions in the electrolytic-bath, that the metals deposited are spongy, non-solid and not as homogeneous as is desired.



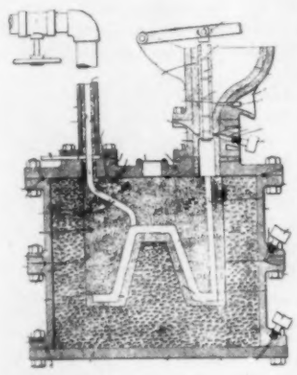
The objects of this invention, are to provide a new and improved method or process, and a new and improved apparatus for carrying the same into effect, wherein and whereby electrolytically-deposited metallic articles of all forms, may be solidly and homogeneously formed, in a cheap and efficient manner.

The improved method and process of so forming articles by electro-deposition may be carried out by many various and widely diverse machines and apparatus; several forms of which are shown in cut.

Such devices as shown are particularly designed and adapted for the electro-deposition of annular-rings, which may be used for various purposes; but in the forms shown, the same are more particularly adapted and designed for the production of the driving-rings of soft copper, etc., to be used as driving-rings upon artillery projectiles to take the rifling of the cannon-bore, and give the projectile proper rotation.

1,272,062. July 9, 1918. **Apparatus for Making Metal Castings.** Simon Lake, Milford, Conn.

The invention has for its object to provide an apparatus, as shown in cut, which will permit the molten metal to flow freely into the mold without trapping air, thereby providing a solid or dense casting in which blow-holes and surface indentations or imperfections are positively avoided, hence minimizing the cost of machining and planing, and the consequent cost in the production of the finished article, the construction and operation being such that a partial vacuum is created within the mold to permit the free flow of the molten metal as it is poured into the mold. Another object of the invention is to provide means for "stamping" the metal so as to positively exclude all air pockets, said stamping means also serving as a valve for controlling the admission of the metal to the mold. Another object of the invention is to provide means for permitting the escape of excess quantities of air and gases which may accumulate in the mold, either during the process of pouring the metal, or through dampness of the molding sand.



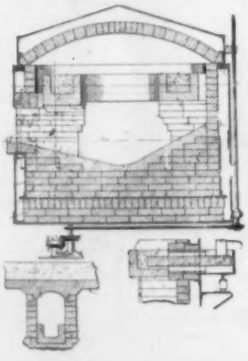
1,272,186. July 9, 1918. **Melting Furnace.** Thaddeus F. Baily and Frank T. Cope, of Alliance, Ohio, assignors to the Electric Furnace Company, of Alliance, Ohio, a corporation of Ohio.

This invention relates to improvements in furnaces wherein a current of electricity passed through resistance material is employed to produce the necessary heat, and has more especial reference to a melting furnace in which one or more resistance troughs are located above and surround the hearth upon which the material to be melted is placed.

The object of the present invention is to generally improve electric furnaces of this type by more properly concentrating the heat therein upon the material to be melted.

Another object is to so dispose the walls of the furnace that the greater part of the heat therein will be either radiated direct, or reflected upon the hearth containing the material to be melted.

A further object is the provision of a furnace of the character shown in the cut, in which one or more resistance troughs are located above and surround or partially surround the hearth.



1,273,762. July 23, 1918. Alloy. Truman S. Fuller, Schenectady, N. Y., assignor to General Electric Company, of New York.

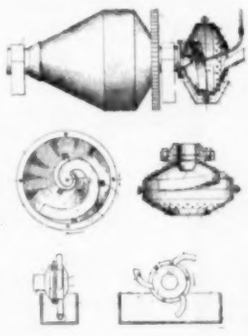
The present invention comprises a new alloy containing aluminum, magnesium, zinc and either iron, chromium, cobalt, nickel, titanium or manganese, or a mixture of the same.

The addition of iron or one of the above-described equivalents increases the tensile strength, hardness and stiffness of alloys containing aluminum, magnesium and zinc. Preferably the metal of the iron group is present in amounts of about 1 to 3 per cent.

When preparing an alloy embodying the invention, containing iron for example, the aluminum is melted and the iron is added either as substantially pure iron, or as an alloy of aluminum and iron, until a homogeneous alloy containing the desired amount of iron is produced by the solution of the iron in the aluminum. The desired proportion of zinc is then added to the melted alloy. Finally the magnesium is added and the alloy is immediately cooled as by casting or in any suitable manner. Alloys containing chromium, cobalt, nickel, titanium or manganese may be made in a similar manner.

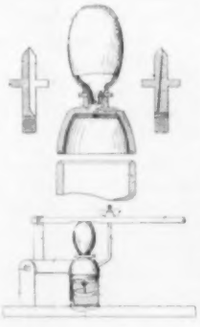
1,272,801. July 16, 1918. **Feeder for Tube-Mills.** Harry W. Hardinge, New York, N. Y.

This invention relates to mills for grinding or disintegrating ores and other materials, particularly mills of the type known as tubemills or ballmills, comprising a rotating barrel or drum having at the end of the axis on which the drum rotates an inlet opening for the introduction of the ore or other material. Such mills usually rotate on hollow axial trunnion, in which case it is customary to deliver the ore to the mill by means of a chute extending into one of the trunnions, the ore being accompanied by a stream of water when the mill is used for "wet grinding." This method of feed is not altogether satisfactory, chiefly for the reason that the material backs up in the trunnion and overflows the same, so that the mill "slobbers," thereby keeping the surroundings wet and necessitating frequent cleaning of the floor. Moreover, fine particles of the material work their way into the trunnion bearings, causing rapid and destructive wear. It is accordingly the object of present invention to provide an improved feeding device, whereby the drawbacks mentioned will be obviated. To this and other ends the invention consists in the novel features of construction and combinations of elements shown in the cut.



1,273,418. July 23, 1918. **Method and Apparatus for Casting Metal.** Alexander Stanowsky, Rotterdam, Netherlands.

This invention relates to a method and to an apparatus for casting metal such as is extensively used by dentists for casting gold plates for artificial teeth, but which may also be employed for other purposes. The said apparatus, as shown in cut, comprises a flask in which the model or pattern formed of wax or the like may be placed in a pad of refractory and absorbent material which in its original state is plastic but which hardens on being heated, the said model being in communication through a narrow passage with a crucible located within the muffle and preferably formed by a depression at the top of the pad. This pad, after the pattern is burned out constitutes the mold. When the flask is heated and the model melted, the wax or the gases generated disperse through the refractory pad, whereby in the latter a cavity is left which exactly corresponds to the outline of the casting to be made.



1,274,186. July 30, 1918. **Method of Cleaning Metal Articles.** Charles Burrows Morey and Charles Joseph Huber, of Buffalo, N. Y., assignors to Larkin Company, of Buffalo, N. Y.

This invention relates to methods of cleaning metal articles by immersing the same in an electrolyte in contact with a metal of more electro-positive properties than the metal to be cleaned.

In carrying out this process any metal may be employed which is electro-positive with regard to the articles to be cleaned, zinc being preferably employed when silver or gold articles are to be cleaned. The electro-positive metal may be of any suitable form, a disk or plate being preferably employed which may be immersed in the electrolyte which should be contained in any suitable vessel or receptacle, preferably made of non-conducting material.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW METAL INGOT MOLD

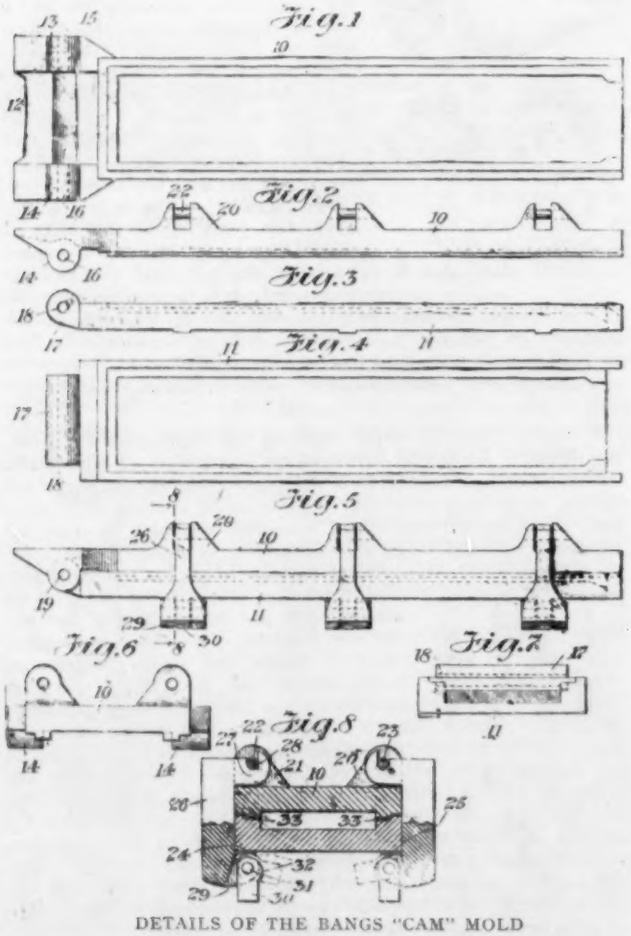
A mold for the casting of metal ingots such as are used in the manufacture of sheet brass, rod, etc., has just been patented by Francis M. Bangs, of Hastings on the Hudson. This mold which is covered by United States patent No. 1,276,609 issued August 20, 1918, is a great improvement on the styles of mold used for such purposes now in use. The mold in its various parts is shown in the cuts, Plates 1 and 2, and the object of the invention is disclosed in the language of the inventor as follows:

"My present invention relates to a mold for casting ingots, although as will be understood, it is not limited to this purpose, as the features to which the invention more particularly relates may be employed in any two part mold for any purpose. Heretofore in molding operations there has been more or less difficulty experienced in both connecting the parts of the mold and disconnecting the same, necessitating the expenditure of considerable time and labor in both operations.

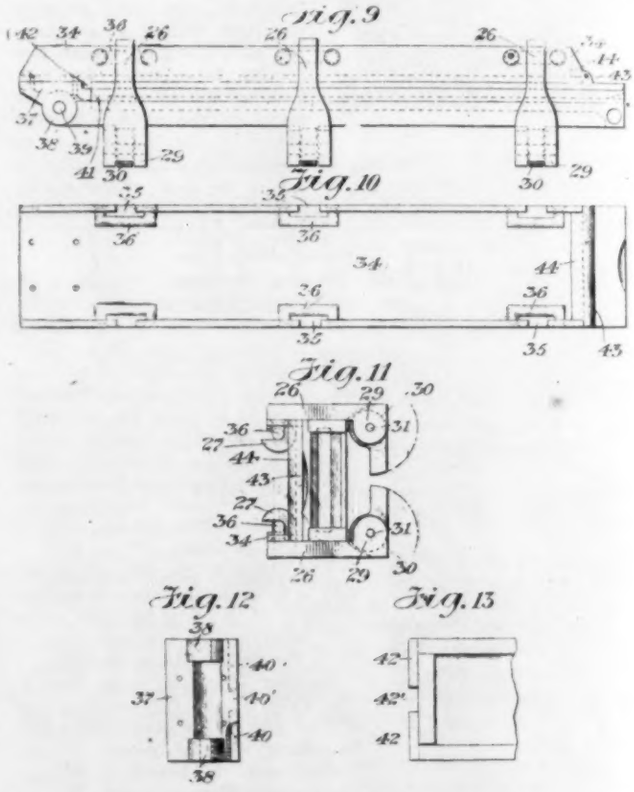
"The object of my invention is to overcome these difficulties by the employment of devices which are so associated with the parts of the mold as to be readily connected and disconnected thereto and therefrom, and when connected thereto to force and hold the parts of the mold together during the molding operation.

"To this end in carrying out my invention I preferably employ one mold part with a series of spaced lugs, and the other mold part with a corresponding series of similarly placed bosses together with a plurality of clamping devices each of which at one end is adapted to be disconnectedly secured to the lugs on one mold part, and at the other is fitted with a pivoted lever adapted by turning the same to engage the corresponding boss on the other mold part to force and hold the parts of the mold in position for the molding operation as will be hereinafter more particularly described."

In the drawing; Fig. 1 is a plan view of the back of the mold; Fig 2 is an edge elevation of the same; Fig. 3 is an edge elevation of the front part of the mold; Fig. 4 is a plan view of that part of the mold shown in Fig. 3; Fig. 5 is an edge elevation of the parts of the mold connected for use; Fig. 6 is an end elevation of the part of the mold shown in Figs. 1 and 2; Fig. 7 is an end elevation of the part of the mold shown in Figs. 3 and 4; Fig. 8 is a cross section taken on line 8-8 Fig. 5; Fig. 9 is a side elevation of a modified form of the invention; Fig. 10 is a rear elevation of the container employed in the form shown in Fig. 9; Fig. 11 is an end view of the parts shown in Fig. 9; Fig. 12 is an elevation of the lower end of the back of the mold as shown in Figs. 9 and 11, and Fig. 13 is a front elevation of the hinged member as shown in Fig. 9.



DETAILS OF THE BANGS "CAM" MOLD



In some forms of work where the mold is subject to unusual temperatures it may be advisable to employ a container and a separate back member of the mold in order to obviate the necessity of course of substituting an entirely new back member when this part, because of cracking or otherwise, becomes unfit for use. The container is a finished part of the mold structure adapted to receive the back mold

member so that the back mold member is subjected to the excessive temperatures and strains and when cracked or otherwise made useless may be discarded and another one used in its place. In this form of the invention as shown in Figs. 9 to 13 inclusive, the container member indicated at 34 is preferably made in channel iron form.

The patent covers seven claims of which the two last are as follows:

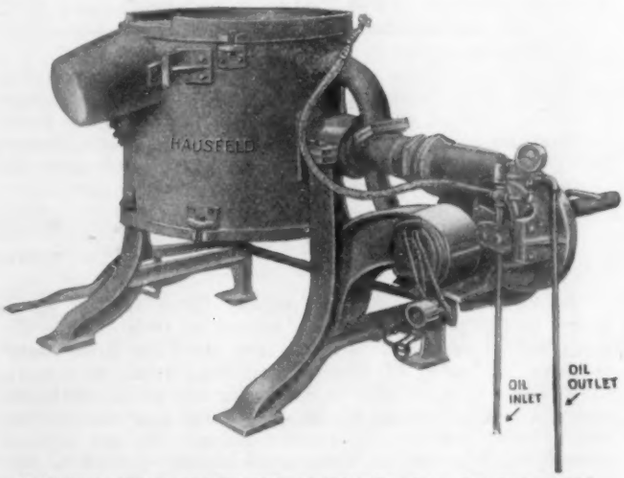
Sixth: A mold comprising a front member, a back member, a container member to which the back member is adapted to be secured, means for connecting pivotally the front member to the container member, and a plurality of clamps each adapted to be disconnectedly secured to the said container member and to act against the front member of the mold to secure and hold the parts together.

Seventh: A mold comprising a front member, a container member, a back member, means for securing the back member to position in the container member, a plurality of clamping devices, a hook at one end of each clamping device adapted to be disconnectedly secured to the said container member, and a lever pivotally connected at the other end of each clamping device and provided with an eccentric adapted to engage a boss on the front mold member and to act against the same when the lever is turned to the connected position for holding the mold parts together.

HAUSFELD NON-CRUCIBLE MELTING FURNACE

The Hausfeld Company of Harrison, Ohio, is the manufacturer and patentee of the furnace herewith illustrated, which was designed particularly for the melting of brass and kindred materials. It is of the open-flame, non-crucible, tilting type and has a capacity of 400 pounds. This furnace which was described in the July 1917 issue of THE METAL INDUSTRY has been greatly improved and is now fitted with a Maxon Premix burner described in THE METAL INDUSTRY for March 1918.

A "complete unit" consists of the furnace proper—lined ready for service—equipped with a Maxon Premix Burner, a one-half-horse-power motor (D. C. or A. C.), a patented fuel oil-feeder with burner and a pouring ladle, all as shown in the illustrations. No equipment other than piping to the gas meter and the fuel oil reservoir, is necessary. The furnace can be had without the fuel oil feeder and burner if desired, but for emergency purposes, in event of failure of the gas supply the complete unit is almost essential.



ILLUSTRATING COMPLETE UNIT FOR GAS OR OIL FUEL

One of the advantageous features of the complete unit is the facility and speed with which a change from gas to oil fuel can be made. As stated in a descriptive booklet of the furnace, a copy of which can be had upon request,—

"The speed with which a change from gas to oil fuel, or vice versa, can be made may be best explained by the statement that a heat started and half finished by gas was finished by oil as the fuel, in practically the same time had the change not been made." The change is accomplished by loosening two bolts, sliding the oil feeder housing forward thereby placing the feeder into gear with the motor, tightening the bolts, removing the plug in the top of the elbow attached to the drum, and inserting the oil burner.

Although of compact form, occupying the minimum amount of space, the oil feeder develops a lift of over 18 feet, and has a delivery pressure of over 60 pounds. It is equipped with a relief valve capable of regulation, the outlet of which is piped to the oil reservoir permitting the return of any excess quantity of oil.

The patented oil burner provides for heating the oil prior to its injection into the furnace. The location of the needle point seat being at the extreme end of the outlet, causes a spray of wide range. To increase this range and break large particles of oil, a small division bar is located directly in front of the burner outlet. With this arrangement every drop of oil is satisfactorily utilized, and the oil being preheated and so finely atomized results in quick ignition.

As the flame, whether from gas or oil fuel, covers the entire inner surface of the furnace, a uniformly distributed heat is obtained and the metal is thereby melted largely by reflection of the heat from the walls, similarly to the effect obtained by melting in crucibles.

ILLUSTRATING TILTING AND LOCKING MECHANISM

The plain shape of the drum facilitates relining. The brick furnished have interlocking joints to prevent the seepage of metal. The manufacturers claim that both the brick and cement employed have excellent refractory qualities and withstand by far a greater number of heats than any other with which they have experimented.

Depending upon the character of the metal to be melted, from 9 to 12 heats can be obtained every 9 hours. One user reports eight heats of 400 to 450 lbs. per day with a gas consumption of 1500 to 1800 cu. ft. and a metal loss of 1½ to 2½%.

With the furnace drum in a vertical position, the furnace can be charged with gates and other scrap, while the blast is on, the metal being thrown on top of the drum where it preheats and then shoved into the charging hole, by means of a bar, as fast as desired

The pouring ladle is located directly over the pouring hole where it remains during the melting of the entire heat. By this arrangement the ladle is heated to a temperature almost equal to that within the furnace and a separate preheating furnace is

dispensed with. It also materially aids in retaining the heat within the furnace.

The furnace is tilted by means of a handle of a length sufficient to provide ample leverage for easy manipulation. The locking arrangement is spring actuated and tends to keep a bar on the frame in constant engagement with the teeth of a sector attached to the drum, securely holding the drum in any position desired. The release of the lock is effected by foot pressure on a treadle at the base, permitting the use of both hands for tilting or rocking the drum. For convenience, a double treadle is provided, one extending to the front and the other to the rear of the operating side, so that when tilting, the treadle most convenient is used. Upon release of the foot pressure the drum is instantly locked.

The Hausfeld Company guarantees efficient and satisfactory results if the furnace is intalled and operated in compliance with instructions furnished.

NEW ALL-STEEL WORK STAND

The field of the work stand has become so varied and its use so general as to render a definition of its purposes, or argument in favor of its employment, superfluous.

These "New Britain" Work Stands, manufactured by the New Britain Machine Company, New Britain, Conn., are made of steel throughout, their unique construction affording ample

NEW BRITAIN ALL-STEEL WORK TABLE

strength with minimum weight—stability and durability without clumsiness.

The two legs at either end are formed by a single steel angle, whose continuation across the top adds both rigidity to the construction and a finish to the rack's appearance.

Trays are of such material and design as to render them remarkably stiff and substantial. The strengthening influence of the 2-in. flange along sides and back is supplemented by a formed hem, which also supplies a smooth finish to edge of tray. Forward edge is turned down to afford most convenient access to and facilitate cleaning of trays. At the corners are welded gussets by which trays are bolted to uprights and given additional support. Stand has no sharp corners or ragged edges by which accidental injury might be sustained.

Stand may be had with two or three trays and with or without drawer. Height to top tray, 32 inches, size of trays, 16" x 26".

A hem of triple thickness around its upper edge and the welding of all joints combinue to produce a drawer of remarkable strength and rigidity.

The slide ways are welded to under side of top tray and give to drawer a smooth movement free from binding or cramping tendency.

Drawer handle is of generous size with a shape of special design, affording a very comfortable handhold.

Cylinder lock of good grade, with two individual keys, is provided. Master keying, if desired, may be had at cost. The possession of master key by foreman will prevent the stowing of contraband in drawers.

Stands are shipped knocked down and may be most easily and quickly assembled as follows: Insert bolts in one side angle and lay it flat on floor or box. Place trays on edge in proper positions and add nuts. Apply other side angle to upper edges of trays and insert bolts. Then stand tray upright and firmly tighten bolts.

SUPPLY FIRMS CONSOLIDATE

The announcement made elsewhere in this issue of the consolidation of The George Zucker Company and the Munning-Loeb Company, under the firm name of A. P. Munning & Company is, of course, of much interest to the trade.

This merger brings together two well known companies; that is, one of the oldest and one of the most enterprising and successful of the younger companies.

The principal products of The George Zucker Company have been Rouges and Buffing Compositions. This Acme White Finish has always been the recognized standard of lime polishes from its inception to the present day. The Munning-Loeb Company has paid more attention to the development of plating and polishing room equipment along three distinct lines; namely, manual, semi-automatic and full automatic operation.

This merger, therefore, brings into one organization unsurpassed facilities and experience in every phase of the finishing of metals.

The officers of the new organization are as follows: A. P. Munning, president; Floyd T. Taylor, general manager; H. L. Zucker, first vice-president; R. C. Fenner, second vice-president; P. P. Munning, treasurer; F. A. Zucker, secretary.

The principal offices will be in the Hudson Terminal Bldg., 50 Church street, New York City, with sales offices in Chicago, Cleveland, Detroit and Springfield, Mass., as well as Pacific Coast agents at San Francisco, Los Angeles and Seattle, and the factories operated by this company are located at Newark and Matawan, N. J., and Chicago, Ill.

FURNACE CEMENT

The Joseph Dixon Crucible Company, Jersey City, N. J., has issued the following information relating to their crucible clay and graphite compound. A letter from the Prier Brass Manufacturing Company, of Kansas City, Mo., reads as follows: "We take this opportunity of expressing our entire satisfaction with the merits and the lasting qualities of your crucible clay and graphite mixture for furnace lining. We are certainly pleased to advise that we have been using this C. C. & G. mixture in relining our brass melting furnaces for the past ten or twelve years and have found it satisfactory in every respect and have never experienced the least trouble.

"During this time we have tried out other similar cements and mixtures and have found nothing that fills the bill nearly as well as yours. It gives us pleasure to recommend your C. C. & G. mixture and trust that your many other customers are obtaining the same good results with this mixture."

The company claims there is nothing better for relining and patching furnaces than Dixon's Crucible Clay and Graphite Compound (also called furnace cement).

It is a highly refractory cement that successfully withstands great heat, resists wear and tear and postpones the day of buying new firebrick.

It will prevent delays and save expensive repairs.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTRO-PLATERS' SOCIETY

New York Branch—Meets second and fourth Fridays of each month at 32 Union Square. Secretary, William Fischer, 300 St. Anns Avenue.

The second meeting of August was held on Friday, August 23 and was opened by President Thomas Haddow. The Outing Committee suggested that the plans for holding an outing this year be discontinued due to the unsettled conditions.

A letter was received from George B. Hogaboom of the United States Bureau of Standards, Washington, D. C., requesting the branch to donate samples for the Fourth National Chemical Show to be held at the Grand Central Palace in New York. It was agreed by the members that it would be impossible to comply with this request, owing to the short time available for preparing the samples.

The motion was carried that all applicants must pass a required test before they become eligible to membership and the Laboratory Committee was instructed to draft up the required questions for this test.

Philadelphia Branch—Meets first Friday in each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets. Secretary, Philip Uhl, 2432 North 29th Street, Philadelphia, Pa.

The regular monthly meeting for August was well attended and after the routine business was transacted, the balance of the evening was taken up with a discussion of the Detroit Convention. The following are new members of the Philadelphia Branch: William J. Weder, Weder Manufacturing Company; E. R. Clark, 1820 Fairmount Avenue, and J. J. Parker, 253 Fulton Street, all of Philadelphia.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

The National Association of Brass Manufacturers desires to call attention to the fact that at its meeting, June 27, it was decided that its members would not supply the little union nut or tail piece that screws into the nose of the bath cock and is commonly referred to as the hose connection on which the hose for sprinkler is slipped over or attached. It is stated that many do not seem to understand that this order is in effect. It was adopted in harmony with the conservation policy of the Government, as the accessory is regarded as not necessary.

INSTITUTE OF METALS

The annual autumn meeting was held in the afternoon and evening of Wednesday, September 11, in the hall of the Chemical Society, Burlington House, Piccadilly, London, W. 1.

The following papers are among those that were to be submitted:

1. "Cold Drawing of Copper and Its Influence on the Properties of the Metal." By W. E. Alkins (Manchester).
2. "Annealing Cold-Rolled Aluminum Sheet By Abbreviated Exposures At Various Temperatures.") By R. J. Anderson, B. S., Met. E. (Cleveland, O., U. S. A.)
3. "Molding Sands for Non-Ferrous Foundry Work." By Professor D. H. Boswell, O. B. E., (Liverpool).
4. "The Hardness of Metals As Determined By the Resistance to Penetration Under Impact." By Professor C. A. Edwards, D. Sc. (Manchester).
5. Note on Manganese Bronze Test Bars. By J. E. Hurst (London).
6. Note on the Use of Liquid Fuel in the Foundry. By Captain A. E. Plant (On Active Service).

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

More than 350 exhibitors have signed contracts to date for space at the Fourth National Exposition of Chemical Industries, to be held in Grand Central Palace, the week of September 23-30, 1918. This means that all of the floor space on the three available exposition floors of the building will be filled to capacity with the most interesting and varied displays relating to the chemical industry and its thousands of ramifications. When the public stops to consider that the wonderful drive now being made on the Western front is due in a large measure to the advances made in chemistry in this country since the beginning of the war, and that our chemical processes varying from munitions and poison gas to alloy steel are, like American fighters, superior to the German product, the importance of a great clearing house for the brains of this industry is at once apparent. That, in effect, is what the huge exposition is—a great get-together which affords the master minds an opportunity to meet in one place and exchange ideas in personal interview in a way that eliminates thousands of miles of railroad travel. For the chemists who will attend this Fourth National Exposition are not merely from the East, but from all parts of the United States, South America, and many from the European Allied countries as well.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

W. M. Corse has resigned his position as general manager of the Titanium Bronze Company, manufacturers of bronze and brass castings, Buffalo, N. Y., to accept a position with the Ohio Brass Company, Mansfield, Ohio.

William Westerman has resigned his position as manager of the brass department of the Western Cartridge Company, Alton, Ill., and has accepted a position as manufacturing manager of the Michigan Copper and Brass Company, Detroit, Mich.

F. K. Pritchard, foreman plater for the past three years at the plants at Ogdensburg, N. Y., and Prescott, Canada, for the Newell Manufacturing Company, manufacturers of brass household articles and bath room supplies, has resigned his position with that company and is now connected with the Worthington Pump & Machine Company, Hazelton, Pa., where he will install a plating and cold galvanizing plant.

Wylie Brown, formerly sales manager of the Bridgeport Brass Company, Bridgeport, Conn., and more recently connected with the North American Copper Company, New York, is vice-president and general manager of the British American Metals Company, Inc., who have purchased the plant of the Manganese Steel Company at Plainfield, N. J. **Horace Al. Staples,** who was also connected with the Bridgeport Brass Company and latterly a consulting rolling mill engineer at 103 Park Avenue, New York, has become works manager of the same company.

METAL MEN IN THE SERVICE OF THE ALLIES—SERIES NO. 7

THE HONOR PAGE

The Metal Industry invites anyone connected with the metal trades who is in or has friends in the service to send in photograph and story of career.

ITALY AND THE 4TH OF JULY

To the Editor of THE METAL INDUSTRY:

To-day all free Europe joins in the celebration of your Independence Day. We knew what it means for you and the principles you Americans glorify in this day; we and all non-Americans now know what that day and those principles actually mean for the rest of the World too; we Italians who have so many of our people still under the hateful inhuman Austrian power, we especially can appreciate the nobility of the principles which caused your intervention for the sake of Humanity and be deeply grateful for it; the powerful and skilful way in which your Country is running to our help is amazing us and we would you could see how deeply touched and thankful we are while writing these lines.

ING. S. BELOTTI & CO.

Milan, Italy, July 4, 1918.

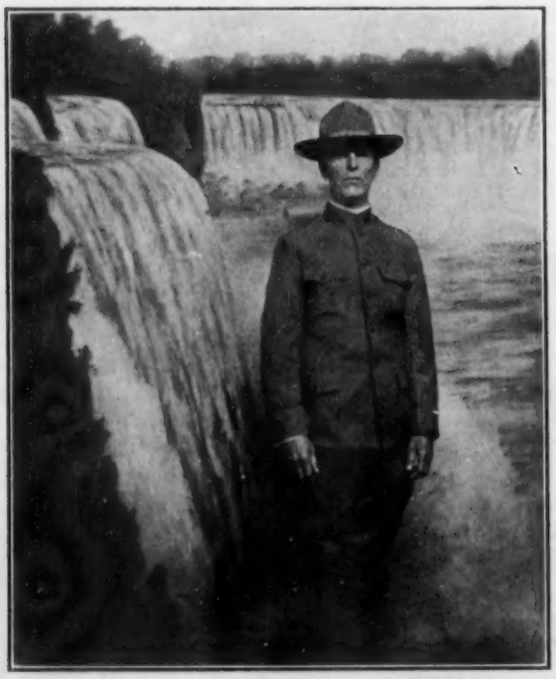
JOSEPH T. HUMBRECHT

Joseph T. Humbrecht, foreman-plater at St. Louis Car Company, St. Louis, Mo., has been called to serve in the United States Army and is now at Camp Funston, Kansas. Mr. Humbrecht, although for some time employed in Detroit, is a member of the St. Louis Branch of the American Electro Platers' Society.

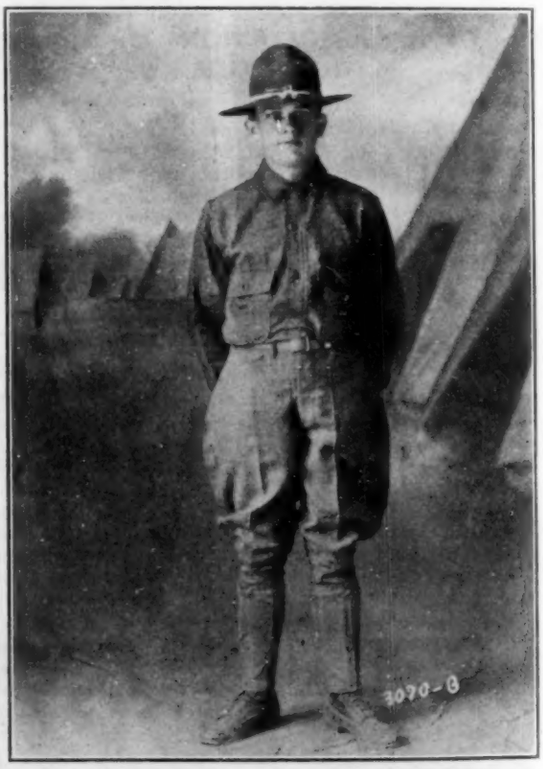
JOSEPH T. HUMBRECHT.

WADSWORTH DOSTER

Wadsworth Doster, treasurer of the Torrington Manufacturing Company, left during the latter part of August for Camp Zachary Taylor at Louisville, Ky., where he has entered the field artillery officers' training camp. The course of training will extend over a period of four months. Alexis Doster, a brother of Wadsworth, is already in France.



LIEUT. B. G. McMANIS, OF THE STANDARD OIL COMPANY, BAYONNE, N. J., IS IN COMPANY D, 11th BATTALION, U.S.N.A.



GEORGE R. PARSONS, OF THE PARSONS SPECIALTY & MACHINE WORKS, PHILADELPHIA, PA., IS NOW OVERSEAS IN COMPANY A, 136th MACHINE GUN BATTALION, 37th DIVISION.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

TORRINGTON, CONN.

SEPTEMBER 9, 1918.

Conditions in the metal industries are fairly satisfactory insofar as Torrington is concerned. Prices are stationary and the delivery of raw materials is greatly improved, this improvement being due largely to a better understanding of the priority list of essential industries. The prices of steel and brass remain about the same; spelter is fluctuating and is higher than it was 30 days ago; chemicals are also higher. Pig iron appears to be practically out of the market, there being an insufficient quantity for the demand. There has been no change in the freight rates since June.

The drafting of men between the ages of 18 and 45 will undoubtedly further complicate the labor situation here. Considering conditions, however, Torrington is probably better off than are many other communities of this size. The employment of women in several of the shops which formerly employed men only is doing much to relieve conditions.

Torrington has been designated as the labor recruiting headquarters for the Litchfield County district of the United States employment service. The district includes the towns of Torrington, Barkhamsted, Bethlehem, Bridgewater, Canaan, Colebrook, Cornwall, Goshen, Harwinton, Kent, Litchfield, Morris, New Hartford, New Milford, Norfolk, North Canaan, Plymouth, Roxbury, Salisbury, Sharon, Thomaston, Warren, Washington, Watertown, Winchester and Woodbury. Headquarters are in the War Bureau at 121 Main street. There are 14 districts in the state, laid out according to industrial unity and transportation facilities.

Part-time employment of women is being tried out at the Excelsior Needle plant of the Torrington company in an effort to help solve the labor question. The following statement was issued by the company:

"Commencing Monday, August 12, we will have employment for women who have not been able to work in the factory a full day. We realize that a great many women would like to give a portion of their time but have not been able to arrange to do so. We have arranged and set aside certain work on which women can work a limited number of hours."

The Torrington company will open its home for its young women employees this month. The home is the former Conley Inn building on Main street, which was purchased by the company several months ago and which has been undergoing extensive alterations. A large number of workers will be accommodated there.

The annual meeting of this company was held during the past month and the following directors were elected: John F. Alvord and Frederick P. Weston, of Torrington; Frank W. Holmes, of Mount Vernon, N. Y.; H. J. MacLachlan, of Yonkers, N. Y.; C. A. McGuire, of Brooklyn, N. Y.; F. V. Munster, of Jersey City, N. J.; and David E. Thomas, of Brooklyn, N. Y.

An increase of 2½ cents per hour has been granted to the employees of the Coe Brass Branch of the American Brass Company.

The manufacture of bullets at the Turner & Seymour plant has been stopped owing to lack of orders, the contracts from the French and American governments having been filled. The bullet-making department is now being used in turning out other products.

Officers of local factories, as shown by annual reports filed with the town clerk during the past month, are:

Progressive Manufacturing Company—President, John F. Alvord; treasurer and secretary, George E. Hammann; and directors, John F. and George B. Alvord and Mr. Hammann.

Torrington Manufacturing Company—President, F. P. Weston; vice-president, D. E. Thomas, of Brooklyn, N. Y.; treasurer, Clive B. Vincent; assistant treasurer, F. V. Munster, of Jersey City, N. J.; secretary, W. R. Reid; directors, John F. Alvord, F. W. Holmes, of Mt. Vernon, N. Y.; H. J. MacLachlan, of Yonkers, N. Y.; C. A. McGuire, of Brooklyn, N. Y.; and Messrs. Munster, Thomas and Weston.

Excelsior Needle Company—President, F. P. Weston; treasurer and secretary, Clive B. Vincent; assistant secretary, John F. Alvord; directors, John F. Alvord, Robert C. Swayze, F. P. Weston, and E. A. Carter and W. E. Gilbert, of Springfield, Mass.

Fitzgerald Manufacturing Company—President, P. J. Fitzgerald; vice-president, M. D. Fitzgerald; treasurer, M. F. Fitzgerald; secretary, B. C. Peck. The four officers comprise the board of directors.

Women are now being employed at the Coe Brass Branch of the American Brass Company for the first time in the history of the plant. Between 50 and 100 women were taken on during the past month, and it is expected that the number will shortly be increased to 200.—J. H. T.

NEW BRITAIN, CONN.

SEPTEMBER 9, 1918.

While there is more or less consternation among the citizens of this city relative to next winter's coal supply, the various factories at present see but little in the fuel situation to cause them any worry. Large quantities of coal for factory consumption are being received and the fact that practically every concern here is working on important government contracts leads many to believe that even in the event of an acute coal shortage the war department would not permit the New Britain factories to suspend operations for lack of fuel. All summer business has been rushing at these concerns, and as fast as one war order has been finished another one has been started. This is true of practically every factory, although the New Britain Machine Company, Landers, Frary & Clark, the North & Judd Manufacturing Company and the P. & F. Corbin division of the American Hardware Corporation are the ones handling the largest of these orders.

It is the New Britain Machine Company that is the leading government factory here. Two large additions have been built by the government to increase the production. One of the newer contracts received by the Machine Company from the government is for shell caps. These are the heavy steel caps fitted onto the end of shells. The various lathes and metal turning machines at this plant fit it for doing this work with the least possible change of equipment. It has been reported that the last order for shell caps approximates $1,650,000. The Machine Company is also working on an order for tripods used in mounting machine guns. This, too, has been a contract of considerable size, as is the one for anti-aircraft gun mounts. In addition to making the anti-aircraft gun mounts, these rifles are mounted on White auto chassis, with trailers, at the factory and driven from there to the proving grounds somewhere along the coast. The latest contract which is being considered at the Machine Company is for 4.7 guns. For several months a model of this gun has been under way at the factory, and if the final contract is awarded the local concern it will probably be for 1,000 guns, and, it is estimated in some quarters, it may take a year, or possibly two or three, to fill the order.

Although but little has been heard of the war-time activities of the Corbin Cabinet Lock division of the American Hardware Corporation, nevertheless this concern is doing its part for Uncle Sam. Unlike most of the other factories, however, it is not dealing in weapons of offense and defense. The C. C. L. plant has many large government orders for padlocks, catches and other similar articles that are being used by the millions in the large cantonments on this side, as well as in the new military structures being erected in France. Only the best of these articles are being purchased by the government.

At the Landers, Frary & Clark plant there is an almost continuous flow of new war orders, including contracts for bayonets, trench knives, knives of other kinds, gas masks, trench kits, mess kits and other articles in demand by the army and navy. So many war orders have been received that it is reported that the domestic output, especially in the cutlery department, is far behind its schedule. The North & Judd Manufacturing Company continues its manufacture of buckles, snaps, fasts and other army accoutrement, as does the Traut & Hine Manufacturing

Company, and the P. & F. Corbin division of the American Hardware Corporation is maintaining its steady output of hand grenades.

The Union Manufacturing Company, the Corbin Screw Corporation and the Russell & Erwin division, the Stanley Works, Hart & Cooley, Hart & Hutchinson and the Fafnir Bearing Company are all busy these days, and while they all do not have the large government orders that some of the larger concerns have, they are, nevertheless, very busy, and there is hardly one but what is receiving, to some extent, government orders. The Hart & Cooley and Hart & Hutchinson companies are making a large number of lockers which are used extensively on ships and in cantonments, and the Fafnir Bearing Company, manufacturers of a very high grade of ball bearings, are naturally finding a market for their entire output.—H. R. J.

PROVIDENCE, R. I.

SEPTEMBER 9, 1918.

With nearly all of the plants in the State in the various lines of industry working on goods for the Government, business is running to an extent never before experienced here. There is still a troublesome shortage of labor in practically all lines, especially among the several branches of the metal industries. Notwithstanding the great increase in the scale of wages, it is impossible to secure the necessary number of expert employees to bring the working schedule to full capacity. Not only are all the concerns driven to the operation of two and even theree shifts daily but the orders ahead indicate many months before there is any likelihood of a diminution in the rush.

In order to obtain additional space for the manufacture of Government orders in which the concern is at present largely engaged, Harry Fulford, president of the Fulford Manufacturing Company, 14 Blount street, Providence, has purchased the four-story and basement brick manufacturing building at 99-107 Stewart street, for many years occupied by the Universal Winding Company. Mr. Fulford has also purchased a tract containing 100,000 square feet of land at Allen's avenue and Ernest street which will probably be utilized as the site for a manufacturing building in the near future.

In spite of the fact that raw materials are high, and in some instances, hard to procure, the fine gold goods end of the manufacturing jewelery industry is the best that it has been in many years. The prevailing conditions are unusual. With not a few manufacturing jewelers bending every effort as far as is possible, to aid in the production of munitions, the demand upon them for their regular line of goods seems to be increased out of all proportions.

Makers of gold and plated gold jewelry, ornaments and trinkets, say that they are being driven at top speed to keep up with the constantly increasing orders. They declare that these are coming, originals and duplicated in bunches, the like of which, it is said, has no comparison in the history of this particular branch of the industry. So hard pushed are some of these manufacturers that their roadmen have not thought of visiting the trade. Usually they start out in early August, but now it looks as though their trips will be postponed until the last of September, in many cases, before the salesmen can find opportunity to absent themselves from their factories. As a matter of fact, in a number of instances, the salesmen are actually working at the bench so great is the call for certain goods.

The employees of the Newell Brass Foundry, Central Falls, enjoyed the hospitality of the proprietor, Frederick E. Newell, at Oak Bluffs, Mass., the past month, having been taken there by automobiles on Friday, the 23rd, and remaining until Sunday evening. This is a custom inaugurated by Mr. Newell several years ago, and followed annually, so that with his employees it has become as much of a fixture as any of the holidays that are fixed by statute. The entire expense of the trip to and from the Bluffs, and hotel expenses while there, are all met by the proprietor, who takes particular care to see that other entertainment is provided for his help during the outing, including sailing, fishing, bathing, etc.

The trade certificate of the Jenkinson Brass Foundry Company, doing business at 139 Clay street, Pawtucket, has been filed at the city clerk's office. The owners are William S. White of Pawtucket and Robert Tyson of Cumberland.

The Providence Architectural Metal Works, 233 Dyer street, was adjudged bankrupt on a voluntary petition filed in the United States District Court on August 26. The petition gives the liabilities at $9,466.01 and the assets at $2,451.04.

Among the latest work that has been done by H. J. Astle & Company, 118 Orange street, this city, is the installation of an eight-head polishing bench in the manufacturing jewelry plant of the J. J. White Manufacturing Company, 158 Pine street, Providence; several Boland blowers for the Robinson Company at Plainville, Mass.; a sand blast for the Waltham Watch Company, at Waltham, Mass., and a positive pressure blower for H. D. Merritt Company, North Attleboro, Mass.

The export department of the C. H. Eden Company, Attleboro, broke all records the past month, shipping 125 per cent more goods than any previous month. For some time the company has claimed the credit of being the largest exporter of imitation jewelry in the United States and last month's record marks another step in the endeavor to assume the supremacy of the world's markets in cheap jewelry, and as outlined by Ralph DeCastro, the firm's representative to South America, "To have Attleboro known all over the world as the real and only hub of the jewelry world."

Israel Broomfield has announced his withdrawal from the Rhode Island Metal & Machinery Company, 477 Eddy street, Providence.

Joseph J. Beck and Harry Goldberg have filed their statements with the city clerk's office that they are the owners of the National Sheet Metal Works, 251 Blackstone street, Providence.

The Colvin Foundry Company, 185 Globe street, Providence, have decided to enlarge their plant and the contract for the work to be done has been awarded. Coke and sand bunkers are to be built of reinforced concrete, two stories high, 28 by 38 feet, containing five rooms. A one-story reinforced concrete building is to be built, 26 by 44 feet, containing five core ovens, two of which will be 10 by 21 feet and the other three, 10 by 12 feet, all to be 12 feet high with balanced steel doors. Retaining walls will also be built for the storage of materials. These walls are to be 16 feet high and 2½ feet thick and 300 feet long. A shipping room, 20 by 38 feet, one story high, of frame construction, and shipping sheds, 24 by 72 feet, are also to be erected.

George J. Lederer is conducting the Crescent Metal Company, 220 Eddy street, Providence, according to his statement filed at the city hall.

A contract has been awarded for a two-story addition to a one-story manufacturing building on Edith street for the Brown & Sharpe Manufacturing Company. It is to be of brick construction, 64 by 55 feet.

Herbert Johnson of Providence and Frederick Sheriff and James E. Brennan of Pawtucket have filed articles of incorporation with the Secretary of State under the laws of Rhode Island for Johnson's Brass Foundry Company, a concern to be capitalized for $10,000 and to be located at Pawtucket.

A unique record in an important branch of war work has been made by Mrs. Bertha Kidd, an employe of the Gorham Manufacturing Company at its Phillipsdale plant in East Providence. Mrs. Kidd works in the department devoted to the filling of defensive hand grenades. A few days ago she loaded 6,516 of these grenades in nine hours and in doing it beat the record previously held by Miss Annie Irving, a worker in a munition filling station in the south-western district of London, Eng.

The Rhode Island Enameling & Polishing Company, 19 Calender street, Providence, is being conducted by Armenag Biberjian and Michael Asdoorian, according to their statement on file at the city hall.—W. H. M.

MONTREAL, CANADA

SEPTEMBER 9, 1918.

The condition of trade in the metal manufacturing lines for the past month in Montreal has been very encouraging. The situation in regard to deliveries of supplies of all kinds for manufacturing from the states shows no signs of improvement and jobbers' stocks are reaching a very low point.

This is a serious situation in more ways than the possible loss of revenue to the various jobbers. In the past three

years manufacturers have drawn their supplies practically altogether from the jobbers and in not a few instances production has been maintained at high levels through jobbers having large stocks on hand.

Virtually all supplies now in the jobbers' warehouses are held for war work of some kind, and unless replacement is permitted on this basis various war enterprises may have to suffer through scarcity of materials. It is possible shipments may be released at an early date and the function of the jobber as a cog in the successful operation of the war machine should not be overlooked.

The Canadian Bronze Company, located at 69 Delorimer avenue, reports that they are very busy on general lines of castings and are behind in their orders.

The Marconi Wireless Telegraph Company is running its factory, located at 173 Alexander street, with a full force.—P. W. B.

DETROIT, MICH.

SEPTEMBER 9, 1918.

The airplane industry, in which large quantities of aluminum is used, is now at top speed and it is reported government contracts are being handled much more satisfactorily. It has been stated the industry here was for a time handicapped by inexperienced and disloyal workmen who found their way into the largest plants in the city. It is said this trouble has been largely overcome by weeding out such employees and by vigilance on the part of the manufacturers. Production is reported rapidly increasing, and like the plants engaged on other war contracts the airplane industry will soon reach satisfactory production.

The automobile industry is being gradually curtailed, the plants devoting their attention primarily to the production of war supplies. Great numbers of trucks, airplane engines and shells are still being turned out.

The plating industry also shows the effect of war work and practically all plants of this kind are busy.

It is generally conceded by authorities that about 90 per cent. of the city's industries are engaged on war work. What the result will be when the war ends, with so many concerns applying themselves to one endeavor, is causing some speculation, but it is generally believed there will be no sudden slump, as already it is apparent that a great many manufacturing concerns engaged on war work have simply deferred their regular production and will find plenty of work when peace is declared. This is true without a doubt in the automobile industry.

The coal situation seems to have cleared up her so far as manufacturing industries are concerned. It is said that practically the full supply for commercial purposes is on hand. There is, however, but little hard coal to be obtained, but as the brass, copper and aluminum plants use very little of this grade of fuel there is a good outlook for the coming winter.

The car shortage still is causing more or less inconvenience. It is said that the situation is much improved, but it is expected, however, lack of cars the coming winter will cause more or less trouble.

The labor situation here still is acute and mechanics, as well as common labor, are drawing big wages. It is reported hard to obtain common labor even at five dollars a day as the munition plants and others engaged on war contracts are paying the very highest wages.

L. F. Miller, who came here from the Mitchell Motors Company of Racine, Wis., is now with the Anderson Forge & Machine Company as metallurgist.—F. J. H.

CINCINNATI, OHIO

SEPTEMBER 9, 1918.

Activity among local tool manufacturers and allied industries, including the foundries, has been greater, if possible, during the past month than at any other time during the war, and prospects favor a continued increase in the rate at which the operations of these branches of the metal industries are progressing. The whole answer lies in the enormous Government requirements, both in the matter of machinery for its own needs and for manufacturers who are working or desire to work on Government orders. To a very considerable extent the Government, through its several departments, has taken in hand the matter of securing mechanical equipment for the manufacturers handling Government work, notably for the Navy Department, and inquiries for machinery and tools of all sorts come from this Department in great numbers. In fact, local plants are now working almost exclusively on Government orders of this sort, as these naturally and properly come first, and are in such volume as to crowd out the usual run of commercial work. Inquiries of the latter sort, therefore, are rapidly diminishing, not only because they are difficult to handle, but because manufacturers with orders for the Government realize fully that they can get much more rapid action by permitting the Government to get their machinery than they could by their individual efforts. As the whole country is now geared up to the one vital object of winning the war, and, to that end, of keeping the fighting forces, both on land and sea, fully supplied with materials and munitions of all sorts, there is no limit to the business to be handled by the metal industry save the physical limitations of the men and machines engaged.

The Lunkenheimer Company, of Cincinnati, one of the largest manufacturers of valves and other engineering specialties in this section, has purchased the property in Fairmont, near its plant, formerly operated by a brewery company, to be used for storage purposes. The company has made several purchases of realty around its plant lately, indicating both its present enormous business and its plans for expansion.

Vacant buildings in the business district of Cincinnati have on several occasions lately been found looted of all metal fixtures of any value, including, principally, lead pipe from plumbing, and brass faucets, chandeliers and the like. Stringent measures are urged by real estate men, who declare that property damage greatly in excess of the metal value has been done.

The Cincinnati Globe Brass Company has been incorporated by John G. Robinson, Jr., Charles E. Dornette and others, with a capital stock of $10,000.—K. C. C.

CLEVELAND, OHIO

SEPTEMBER 9, 1918.

Executives from all branches of manufacturing industries in Cleveland now are being chosen by officials at Washington to assist the government in the maintenance of its army and other fighting equipment. Many of these men, highly paid heads of their industries, will leave civilian work to take up their new duties exclusively. First to be thus recruited will go into the motor truck division and already about 100 men holding executive positions in local shops have signified their intention of joining. The work is being directed by George E. Randles, director of maintenance of the motor transport division, and formerly general manager of the Foote-Burt Company in this city.

The government is continuing its plan for labor conservation to win the war by the appointment here of an employers advisory board for Cleveland. The board will represent 750 Cleveland firms. Those nominated for the committee are: W. D. Sayle, president of the Cleveland Punch and Shear Company; F. E. Drury, chairman of the Cleveland Metal Products Company; Edgar Adams, superintendent of the Cleveland Hardware Company.

No trade is co-operating better than the metal industry in the fall drive for thrift stamps, started this month. Although the movement still is in its earliest stages, the pattern works of the Aluminum Castings Company, announces a 200 per cent quota subscribed, and others are close to or have already passed their 100 per cent. quotas. The 100 per cent. factory is one where every employee not only takes as many stamps as he took the last time, but $1 more besides. "Colonel" John Sanwalt conducted the campaign at the Aluminum Castings Company. The campaigners are concentrating on the metal industry, to start with, and this week visited the Ferry Cap and Set Screw Company, the Peerless Motor Car Company, the National Screw and Tack Company and the Steel Products Company. There is a caravan of entertainers stirring up enthusiasm at all plants.

Fire marshals are investigating a blaze which did $2,000 damage in the east end plant of the Standard Parts Company,

and which for a time threatened the entire building. The fire was discovered about noon, and had done much damage to upper parts of the building, electrical equipment and stock.

What may develop into one of the most stupendous airplane building schemes is contemplated by Cleveland manufacturing interests following the appearance here this month of W. H. Workman, general manager of the Handley-Page Aeroplane Company, London. Mr. Workman proposes 10,000 bombing planes, with which to attack Germany, and proposes to have them built in the United States and driven across the Atlantic. Mr. Workman's plans call for an expenditure of half a billion dollars for the project, and that the plan would be completed in 10 months from the day work is started. He would have the planes start from Newfoundland, with stops at the Azores and Portugal, and with watch stations through the use of war ships stationed 100 miles apart. Cleveland interests are awaiting word from the war department on the project.

One of the biggest individual demands upon the metal industry here is expected to develop this month, when negotiations between the war department and the White Motor Company may be completed. The plan calls for the manufacture of 17,000 2-ton trucks by the White Company. The order, if placed here, will be so large that it will be divided between the White company and other truck concerns here and in Buffalo and Detroit. Among the firms likely to figure in on this contract are the Peerless, of this city, the Pierce Arrow, of Buffalo, and the Packard, of Detroit.

The American Bronze Honor Roll Company, New York City, is contemplating the construction of a factory in this city, according to M. J. Grossman, attorney. This firm will manufacture a tablet to be used by business and industrial firms honoring members entering the country's service. A feature of the tablet is that it can be extended so that additional names can be placed upon it. This feature is patented. With the erection of a factory, the entire business of this firm will be conducted in Cleveland.

The Central Brass Manufacturing Company will add to its East Side plant, in order to keep up with government demands for its product.

Readjustment of the labor situation has developed through the taking over of employment agencies by the government. Headquarters for Cleveland have been established at City Hall, with C. F. Arndt, formerly of the State-City Free Employment Bureau in charge. More than 1,000 applicants asked for work the first day, and many more employers called. There will be six labor agencies under the direction of the government here. All Ohio and West Virginia will be served with labor through this medium.—C. C. C.

COLUMBUS, OHIO

SEPTEMBER 9, 1918.

The metal market in Columbus and central Ohio territory has been quite steady during the past month. There has been a fairly good demand for aluminum, brass, copper and type metals, but receipts are not as large as formerly, due largely to the congestion on railroads which prevents prompt shipments. On the whole the tone of the trade is satisfactory and prospects are considered fair.

Government prices prevail on all metals which have been regulated by the federal officials. Brass is one of the strongest points and is being used extensively in this territory. Prices are about the same as a month ago. There is also a good demand for copper and zinc. Tin is not quite as active as formerly. Some lull was reported in aluminum but that is apparently passing and the demand is quite a good deal stronger.

One of the strongest points in the market is the demand for babbitt and type metals. Dealers in that class of metals have a difficult time in getting shipments. Spelter is in fair demand and the same is true of lead.

The Cincinnati Globe Brass Company, of Cincinnati, O., has been incorporated with a capital of $10,000. The incorporators are John G. Robinson, Jr., Helen Schnell, Chas. E. Dornette, Ethel C. Alspach and Nelson Schwab.

The Metal Parts Manufacturing Company of Cleveland, Ohio, has increased its capital from $10,000 to $225,000.

The Apollo Metal Products Company of Cleveland has been incorporated with a capital of $10,000 to deal in metal products. The incorporators are H. R. McManamon, W. Sangster, Wm. M. Monroe, Z. S. Hammond and Joseph Dembe.—J. W. L.

WASHINGTON, D. C.

SEPTEMBER 9, 1918.

Because there is a marked shortage in the supply of brass for shells, cartridges, condenser tubes and other products essential to war, the brass manufacturers of the country were called to Washington the latter part of August. At a conference with Chairman Baruch they promised full co-operation with the Government officials to speed up the production of rolled brass. Plans suggested to this end were:

1. Each mill to take its full share of Government business.
2. Each mill to take work best suited to its equipment.
3. Cut off all non-essential uses of the products in which there is a shortage.
4. Determination by the manufacturers to get out the product in the face of obstacles—in other words, to work up to full capacity.

The meeting of the manufacturers to consider the Government's requirements for its own forces and to supply the needs of the Allies was called by Everett Morss, chief of the Brass Section of the War Industries Board. The industry was largely represented.

The chief difficulty in the way of maximum production, it developed, was shortage in labor. It was stated that with 9,600 additional unskilled laborers the mills could increase their output 33 1/3 per cent. Theoretically there is mill and machine capacity to meet demands, but full capacity is seldom attained at a mill. A number of plants are installing additional facilities, and the output of such plants will be increased shortly.

The cutting out of non-essential uses of the particular products needed in the war program was urged as a necessary move in the plan to give some relief immediately to a situation that is serious. This part of the program to prevent shortage in war material will be taken care of later by the War Industries Board, and the brass manufacturers pledged their best efforts to get the greatest production from their mills. Their gross production is now figured at about 2,910,000 lb. per day. An increase of a third would give a production of 3,388,000 lb. a day, while the demands, according to latest figures, are about 4,685,000 lb. per day.

To conserve brass the War Industries Board has taken steps to control the output of surface condensers for ship engines. The action followed a conference of the brass manufacturers with B. M. Baruch, chairman of the board, and representatives of the Navy and Emergency Fleet Corporation and a later conference of the board with the war service committee of the surface type condenser industry. About forty-five manufacturers are affected by the decision. They are being notified to enter into no new contracts with any purchaser, Government or civilian, except on a permit issued by the War Industries Board. To secure such a permit the proposed purchaser must demonstrate his need to the satisfaction of the board and this need will be considered in connection with the needs of the Government in the conduct of the war.

The manufacturers will be permitted to fill, where possible, existing orders with non-ferrous condenser tubes on contracts for shipment prior to January 1, 1919. On contracts after January 1, the manufacturers are urged to put steel tubes on condensers for land uses and are directed to send immediately estimates for steel required for this purpose. The Navy and the Emergency Fleet Corporation are exempt from these orders and regulations of the board as to condensers for ship use, but not as to condensers for land stations.

Several months ago the Government assumed control of the turbine engine industry because of the shortage in the supply and their essential need in the Navy and Emergency Fleet war programs. The non-ferrous condenser is an essential integral part of the turbine and the shortage in its production caused the Navy and the Emergency Fleet Corporation officials to appeal to the Government for stricter regulations concerning its production and distribution.—The Iron Age.

PHILADELPHIA, PA.

SEPTEMBER 9, 1918.

The majority of business that is passing in copper is for government accounts, as has been the case for many months. It is estimated that between ninety and ninety-five per cent of the material being sold is for work of this character. Production is reported by the local trade as not being up to requirements, although smelter production is heavy. Dealers say that they have been able to keep holders of war contracts supplied with copper in sufficient quantities to meet present and nearby needs. There, however, seems to be little opportunity to supply consumers with a quantity sufficient to create a surplus.

A brisk demand is reported for brass and brass products and virtually all material is for government work either direct or indirectly. The situation in this material like in many other metals is becoming such that the local trade believe that within a short time there will be virtually no brass obtainable except for government work.

There is a particularly good demand for brass rods, the trade reports. Dealers in this stock have been notified by mills to exercise care in disposing of stock as the government is about to place a large order for brass rods. While supplies now held by the trade here is estimated to be fair and with the current demand as it is will soon become scarce.

Capacity for the making of bronze will be tripled at the plant of the American Bronze Corporation, Berwyn, Pa., by the erection of a large addition.

James F. Griffith, 420 Moyer St., operating a metal works, will build a one story brick machine shop 32 x 100 feet.

Some of the firms engaged in plating are securing a fair amount of work from materials that are being taken by the Emergency Fleet Corporation. Others are finding that business with the stove trade is good and nickel plating of small stoves appears to be coming in in a steady way. Others find that there is little business passing.

The Newton Machine Tool Works, 23rd and Vine Sts., has filed plans for alterations and extensions in their machine shop to cost $12,375.

Some of the metal trades here are finding that the supply of labor is much improved through the efforts that have been made by the Federal Labor Bureau to furnish unskilled labor to the plants. Others have not shared so well in the supply that has been distributed. The new draft is expected to have an effect of again placing the labor supply in all plants in poor shape. The trades here express an opinion that the labor situation is becoming more stabilized and there is not so much shifting of labor front one place to another as was noticeable last month.—F. W. C.

TRENTON, N. J.

SEPTEMBER 9, 1918.

Trenton metal manufacturers are greatly concerned over the new draft which will take men between the ages of 18 and 45 in the army and wondering how they will manage to operate the plants if more skilled workmen are taken from them. The first draft took many good metal workers from the Trenton industries and left the works somewhat crippled. New mechanics who are not in the skilled class had to be engaged and in many cases important work was spoiled. "We could not do any better than to hire the first man who came along," said one manufacturer to the representative of THE METAL INDUSTRY, "even though some work was spoiled. It was better than having to close entirely. I am afraid the new draft is going to cause some of the plants—where war work is not being turned out—to close down." Only those men in the essential plants will be allowed to remain there and the remainder will have to either enter the army or find employment where war work is being turned out. The Trenton plants have plenty of work at the present time and some are compelled to operate overtime. Girls and women are being given positions at several of the plants and the manufacturers hope to have them "broken in" so they can ably fill the places of men taken into the army or navy.

The big plant of the Jonathan Bartley Crucible Company, situated on Oxford street, Trenton, N. J., was damaged by fire to the extent of nearly $100,000 recently. The fire was a mysterious one and started in the packing shed adjoining the main plant. Lewis Lawton, president of the works, informed a representative of The Metal Industry that he was unable to account for the serious blaze. The flames swept through the four floors of the plant, communicating quickly to the upper portion through the elevator shaft. All the old machinery in use at the time and many thousand dollars' worth of new machinery, which was in the building and ready to be set in position was ruined. Valuable retorts and crucibles, a lot of which were ready to go into the kiln, were destroyed. The Bartley company resumed operations the following day in the old plant. Several firemen were overcome by the blaze.

In the last Red Cross drive in Trenton many of the metal industry plants responded liberally. The Trenton-Ingersoll watch company donated $500, while the employes of the Jordon L. Mott Company gave $1,250. Other concerns donating were: Westinghouse Lamp Company, $500; Mercer Automobile Company, $125; Skillman Hardware Manufacturing Company, $50; Co-operative Safeguarding Company, $25.

John W. Shuster, who was assistant general manager of the Skillman Hardware Manufacturing Company for some time, has resigned his position to become general manager of the Frenchtown Porcelain Company, Frenchtown, N. J. Mr. Shuster was connected with the Skillman company for the past eight years, and was recently elected a director of the company following the new organization.

William Boulton, a former chief inspector at the Bordentown, N. J., plant of the American Ammunition Company, has been made mechanical supervisor in the fuse department of the Keystone Manufacturing Company, Riverside, N. J. He was one time an instructor in a munitions plant in Canada.

The plant of George Benda, Boonton, N. J., manufacturer of bronze powder, has been ordered sold at auction by Alien Property Custodian A. Mitchell Palmer. It is said that the plant is owned entirely by enemy aliens, and that it is controlled by German capital. It is a branch of a concern in Fuerth, Bavaria, familiarly known as the Boonton Bronze Works. The plant was established at Boonton about fifteen years ago by Benda, since deceased, and more recently has been controlled by Adolph Neubauer and Eugene Kirschbaum, both of whom are now in Germany. About fifty men are now employed at the plant.

The Rare Metals Products Company, Glen Ridge, N. J., has purchased the plant of the Seaton Chemical Company, at Belleville, N. J., at a cost of $150,000, and expects to double the output of its present plant. The property consists of seven and a half acres and is situated along the Erie Railroad.

The Kearney Brass Foundry, of 290 Maple street, Kearney, N. J., has filed a certificate of incorporation, Samuel P. Blauvelt being the authorized agent. The capital stock is $25,000, of which $20,000 is paid in. The incorporators are Jacob C. Chadwick, of 22 Ninth avenue, Newark; Samuel P. Blauvelt and Mrs. Susan H. Blauvelt.—C. A. L.

NEW YORK, N. Y.

ELECTRIC FURNACE WAR SERVICE.

On May 15, at the Yale Club, New York City, a meeting was held of certain electric furnace manufacturers of the United States at the request of the General War Service Committee of the Electrical Manufacturing Industry. At this meeting C. L. Collins, 2nd, representing the General War Service Committee presided, and stated that in his opinion, the electric furnace manufacturers should consolidate in the form of a unified organization to act under the General War Service Committee in preparing and guaranteeing information, in connection with the electric furnace industry to assist the government in its war preparations.

At this meeting a Temporary Committee composed of John G. Bergquist, of the Hamilton and Hansell Company; John A. Dixon, of the John A. Crowley Company, and F. J. Ryan, of the Electric Furnace Construction Company were appointed as a committee to notify all of the manufacturers of the intention to form such an organization. Of this committee, F. J. Ryan was nominated as Chairman.

As a result a final meeting was held on June 26, at a luncheon at the Bankers Club, New York City, and the movement was firmly ratified and a permanent committee was organized, the members of which are: G. H. Clamer, chairman, John G. Bergquist, C. B. Fletcher, S. N. Castle, F. J. Ryan, secretary.

The concerns that have become members of this organization, which is to be known as the Electric Furnace Industries War Service Committee are as follows: Hamilton and Hansell Company, New York; John A. Crowley Company, New York; Ajax Metal Company, Philadelphia, Pa.; American Metallurgical Corp., Philadelphia, Pa.; Electric Furnace Construction Company, Philadelphia, Pa.; Pittsburgh Furnace Company, Pittsburgh, Pa.; Booth-Hall Furnace Company, Chicago, Ill.; Industrial Electric Furnace Company, Chicago, Ill.; C. W. Leavitt & Company, New York City; Ludlam Electric Furnace Company, Woolworth Building, New York; T. W. Price Engineering Company, New York; Beckman & Linden Corporation, San Francisco, Cal.

A number of other of the electric furnace companies have signified their intention of joining this organization but as yet have not been enrolled.

The object of the Electric Furnace Industries War Service Committee, as detailed and accepted by its members, is the formation of an organization for the duration of the war, or for such a length of time as it is apparent that there is a necessity for same by the government to compile and detail information pertaining to the electric furnace industries in connection with steel, non-ferrous alloys and metals in general where the melting problem is concerned.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Warner Brothers Company, Bridgeport, Conn., has leased the Staub building on West street, New Milford, Conn., which they will use for assembling metal parts.

The Lumen Bearing Company, Buffalo, N. Y., is building an addition to its plant at an estimated cost of $5,000, and which will be used for smelting and refining metals.

A. W. Hahn, treasurer of the **Electrolytic Zinc Company, Inc.,** 3 South William street, New York, announces that the company has discontinued operations at its plant in Baltimore, Md.

The Germann Bronze Company, Erie, Pa., which operates a metal foundry, has had plans drawn and will build an addition to be used as an office and extension to its machine shop, to cost about $10,000.

Matt Corcoran & Company, Louisville, Ky., operating a brass and copper foundry, is erecting an addition, 30 x 125 feet, and will install some additional equipment for filling Government contracts.

Richard Carswell, 277 Lake street, Newark, N. J., has filed certificate and notice of sole ownership of the business of the **Industrial Wire and Metal Works,** which is conducted at 95 High street, Newark, N. J.

The Brown Specialty Machinery Company, Chicago, Ill., makers of sand-blast equipment, will show a sand-blast machine at the Allied Metals Congress Exhibition, Milwaukee, Wis., October 7-12, 1918, which will be of particular interest to platers.

The Connecticut Brass and Manufacturing Company, Bridgeport, Conn., recently completed the erection and has fully equipped a 1-story, 30 by 40 feet addition to its plant. The company operates a casting shop, rolling mill, and stamping and brazing departments.

The work of recostructing the plant of the **Precision Castings Company,** Pontiac, Mich., which was destroyed by fire in May, is being hurried, as the concern was engaged exclusively on Government work. The company operates a brass, bronze and aluminum foundry.

The Buffalo Metal Goods Company, Winchester and Northland avenues, Buffalo, N. Y., manufacturers of automobile parts and stamped metal specialties, is erecting an inspection and shipping building. The company operates a tool and grinding room, stamping, plating and polishing departments.

The Imperial Brass Manufacturing Company, 1200 West Harrison street, Chicago, Ill., has recently opened a large welding shop. This department occupies a new building, 50 x 150 feet, which was erected especially to speed up Government contract work, in which the use of the oxy-acetylene welding process is required.

Edward G. Gagel, proprietor of the **Art Casting Works,** 104 Verona avenue, Newark, N. J., has discontinued manufacturing gold and silver castings and bronze art work, and on account of the great demand for green sand work in brass and bronze for war work, has equipped his foundry in order to handle such castings.

The Cleveland Smelting and Refining Company, Cleveland, Ohio, which was recently organized by Emil Stotter, formerly head of the Lake Erie Smelting & Refining Company and Albert J. Hall, formerly connected with the Michigan Smelting and Refining Company, Detroit, Mich., is building a new plant for the smelting and refining of metals.

The Foundrymen's Supply Company, Milwaukee, Wis., is the successor of the C. F. Sammond Company, which in turn had succeeded the American Sales Company. Under the new management this company has taken over molding, core and other grades of sand from twenty-one supply points in the United States. It also handles steel ladles, chaplets, brushes, plumbagos and facings.

The General Aluminum & Brass Manufacturing Company, Detroit, Mich., has awarded contracts for the erection of a two-story building with core ovens, 100 x 100 feet; brass furnace building, 60 x 100 feet; machine shop, 60 x 140 feet and a vacuum steam heating plant. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, tinning and soldering department.

The New Standard Hardware Works, Mount Joy, Pa., is installing a tinning plant, including the process for the hot tinning of steel stampings at the plant of the Buhl Stamping Company, Detroit, Mich., which they expect will be in operation sometime in December. The Standard Works has also installed the unit system and process at the National Enameling & Stamping Company, Milwaukee, Wis. This is also a hot tinning outfit complete for tinning steel stampings.

On August 30, the 1,200 employees of the **Stamford Rolling Mills Company,** manufacturers of brass and copper products, at Stamford, Conn., voted to work all day Labor Day in order that there should be no let up in production of munition material. A cablegram was sent to Marshall Foch apprizing him of the decision and assuring him that they would see that his armies got one hundred per cent production from the mills every day.

The business and plant of the Rumford Metal Company, manufacturers of magnesium in ingots and powdered form deoxidizing and light alloys, Rumford, Maine, has been purchased by the **American Magnesium Corporation,** Niagara Falls, N. Y. Bernard Cunniff, who was president of the Rumford Metal Company, is vice-president of the American Magnesium Corporation and will be actively connected with that company's operations in the future.

The Hausfeld Company, Harrison, Ohio, will have an attractive exhibit of their products at the Allied Metals Congress to be held in Milwaukee, Wis., the week of October 7, 1918. This company has developed a number of important impovements in non-ferrous metal furnaces, oil burners, high temperature cements, vibrators, etc., which will be of interest to visitors, especially those in the foundry field. The exhibit will be in charge of Joseph E. Hausfeld, C. E. Haddock and J. S. Armour, who will be pleased to give all information pertaining to the products exhibited.

The report that has been current in the daily press for some time in reference to a new metal that was said to have been discovered by chemists in Canada is somewhat misleading. The facts in the case are that it is the line of Stellite alloys invented by Elwood Haynes of Kokomo, Ind., and marketed under that name that is meant. The Canadian metallurgists have developed improved methods of producing cobalt and chromium which are the principal constituents of Stellite alloys and these alloys are now being manufactured under the Haynes patents at Deloro, Ontario, Canada by the **Deloro Smelting and Refining Company, Limited.**

Further evidence as to the extent that women are replacing men in metal works is shown in the advertisement in the Philadelphia, Pa. papers by the **American Standard Metal Products Corporation,** Paulsboro, N. J., for help on ordnance contracts. The advertisement reads as follows:

"Girls on Government Work. Good wages and pleasant working conditions. American Standard Metal Products Corporation, Paulsboro. Apply at United States Employment Service Office, 5th and Taylor Avenue, Camden, New Jersey. Ask for Miss Olive Middleton or write for particulars."

The General Motors Corporation, Detroit, Mich., is said to have a large interest in the Doehler Die Casting Company, Ninth and Huntington streets, Brooklyn, with plants also at Newark, N. J., and Toledo, Ohio. It is understood that the foundry now in course of construction at Flint, Mich., for the production of aluminum castings, will be operated by the General Motors Corporation in conjunction with the Doehler company, which has specialized in the manufacture of die castings of aluminum, brass, bronze and other materials. The company recently increased its capital from $500,000 to $1,000,000, and is building a seven-story, reinforced-concrete addition to its Brooklyn works, 90 x 105 feet, to cost $175,000.

J. S. Newton, Commissioner of Patents, United States Patent Office, Washington, D. C., calls attention to the need for technically trained persons for the examining corps of the Patent Office. Men or women are desired who have a scientific education, particularly in higher mathematics, chemistry, physics, and French or German, and who are not subject to the draft for military service. Engineering or teaching experience in addition to the above is valued. The entrance salary is $1,500.

Examinations for the position of assistant examiner are held frequently by the Civil Service Commission at many points in the United States. One is announced for August 21 and 22, 1918. Details of the examination, places of holding the same, etc., may be had upon application to the Civil Service Commission, Washington, D. C., or to the Patent Office.

The Kalbfleisch Corporation of New York has rented spaces 555 and 556 on the third floor of the Grand Central Palace New York City, for its exhibit at the Fourth National Exposition of Chemical Industries, to be held during the week of September 23rd. The Corporation will exhibit samples of sulphuric, nitric and muriatic acids and aqua ammonia, which are of such interest at the present time, owing to the great demand by the Government for war purposes.

Samples will also be displayed of the different grades of sulphate of alumina used for the purification of water, paper sizing, dry colors, etc., also samples of Salt Cake, used in the manufacture of glass and paper makers' sulphate, or kraft pulp. Owing to the great expansion in the manufacture of aniline colors in this country, the pure, anhydrous sulphate of soda, a specialty manufactured by the Kalbfleisch Corporation for the standardization of aniline colors, will merit unusual attention. So, also, will its exhibit of permanganate of soda, the manufacture of which has been perfected. This specialty is now widely used as a substitute for permanganate of potash. Representatives of the corporation will be glad to welcome visitors to the exhibit.

REMOVALS

The Metal & Thermit Corporation, New York, manufacturers of manganese alloys, has moved its Toronto, Canada office from 103 Richmond Street, W., to 15 Emily Street.

The Yorkville Manufacturing Company, manufacturers of sheepskin wheels for the polishing trade, leather products, etc., has moved its factory from 249 Hinsdale Street to 273-275 Lorimer Street, Brooklyn, N. Y.

INCREASE IN CAPITAL STOCK

The Ideal Brass Works, Indianapolis, Ind., has increased its capital stock from $10,000 to $20,000, and is taking bids for the erection of a one-story factory to cost $25,000.

The A. Gilbert & Sons Brass Foundry Company, St. Louis, Mo., has increased its capital by $50,000 and will purchase additional foundry equipment. The company operates a smelting and refining department, brass, bronze and aluminum foundry, brass machine shop, tool room, casting shop and cutting-up shop.

CHANGE IN FIRM NAME

The name of A. C. Dallas & Son., Inc., has been changed to the **Dallas Brass & Copper Company.** This change in name does not involve any change in the personnel or in the organization.

FOREIGN TRADE OPPORTUNITIES

For addresses of these inquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

27195.—An agency is desired by a firm in Australia for the sale of sheet iron and steel; telephone equipment; nail wire; brass, copper, and aluminum sheets; and rubber goods. References.

27228.—An established wholesale firm in Bolivia is in the market for table cutlery and silver-plated flat and hollow ware. Cheap and medium grades are preferred. Catalogues, price, lists, and samples should be submitted wherever possible. References.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture stamped metal articles.—The Plymouth Stamped Metal Company, Plymouth, Ohio. Capital $25,000. Incorporators: D. S. French, B. Davis, Elizabeth French, A. S. Davis and F. D. Gunsaullus.

To deal in metal products.—The American Metal Products Company, Cincinnati, Ohio. Capital $25,000. Incorporators: Alfred T. Kreimer, Harry W. Freeberg, Fred G. Jackson, H. Stanley Kreimer and Charles A. Hofling, Jr.

To deal in brass and aluminum castings.—The Hamilton Brass and Aluminum Castings Company, Hamilton, Ohio. Capital $15,000. Incorporators: Harry J. Koehler, Jr., Charles E. Koehler, Charles W. Cork, Mrs. Emma Cork, and Harry J. Koehler.

To Manufacture Aluminum Solder.—The Crown Aluminum Solder Company, 883 East 134th street, New York. Capital $5,000. Incorporators: Herman Michaelis, president; Louis Paskus, vice-president; John B. Schlesinger, treasurer, and Herman Friedman, secretary. The company will operate a foundry, brass machine shop, tool room.

PANGBORN CORPORATION EXHIBIT

The Pangborn Corporation, Hagerstown, Md., announces that it will have the following apparatus on exhibition at the Foundrymen's Convention to be held in Milwaukee, Wis., October 7-11, 1918.

Operating exhibit of new hygienic and automatic sand-blast devices complete with exhaust-arrester system.

This will comprise various types and sizes of machines to handle work from the smallest to the largest, adaptable to the character of equipment to include.

Type EA continuous feed, self contained, stationery nozzle cabinet sand-blast.

Type EN continuous feed, self contained cabinet sand-blast, with supported movable nozzle, adjustable in every dimension.

Type EH table-cabinet sand-blast. A hygienic direct high pressure equipment for large work.

75 M/M shell cleaning cabinet sand-blast, of the automatic, continuous suction feed type.

Display of castings, before and after sand-blasting, of varying sizes, character and design.

Enlarged photo illustrations of recent installations for various classes and volumes of work.

Representatives who will be in attendance are Thomas W. Pangborn, president and general manager; John C. Pangborn, vice-president; H. D. Gates, sales manager; W. C. Lytle, assistant sales manager; H. F. Liedtke, engineer; F. J. Hull, assistant engineer; P. J. Potter, district sales engineer; A. L. Holmes, district sales engineer; Geo. A. Cooley, district sales engineer; Chas. T. Bird, district sales engineer.

SAFETY CONGRESS

The co-ordination of America's resources for the winning of the world war will take on added significance the week of September 16th to 20th, when the Seventh Annual Safety Congress of the National Safety Council convenes at the Hotel Statler, St. Louis, Mo. An elaborate sixty-four page program has been issued for the Congress.

A message emphasizing the pressing need for the conservation of man power will be received from President Woodrow Wilson, a member of the Cabinet delivering the principal address at a public meeting to be held the opening day of the convention —"Safety as an Asset in Winning the War," by the Hon. Franklin K. Lane, will express the views of our national government in its determination to prevent every avoidable accident in industrial America. Charles M. Schwab, Director of the Emergency Fleet Corporation, will give the principal address at the opening session of the convention, his subject being "The Democratization of Industry."

BUSINESS TROUBLES

The Columbia Bronze Company, with offices and a plant at 110-118 Arch street, Camden, N. J., has been thrown into bankruptcy by a number of creditors. The company, according to the petition filed, has debts amounting to $26,072.30, while the assets are $13,250. The company, through its president, Harry W. McCaulley, announces in the papers filed in the United States District Court at Trenton, N. J., that the plant is worth $15,675 and that it has about $500 worth of material on hand. The value of the fixtures is placed at $1,900. Some of the creditors are the Jonathan Bartley Crucible Company, The Ajax Metal Company and the International Arms and Fuse Company. Lawyer William Earley is solicitor for the company.

Former Governor James F. Fielder, of Jersey City, N. J., and Newman Erb, of New York, have been appointed federal receivers of the British-American Chemical Company, Inc., a New York incorporation with a manufacturing plant at Ridgefield Park, N. J. Application for the receivers was made by Embrey W. Stephenson, of Ridgefield Park, with claims of more than $3,000 for wages and other claims assigned to him. Stephenson says that other persons have taken actions against the company on sales of goods.

AMERICAN MUSEUM OF SAFETY

Arthur H. Young, director of the American Museum of Safety since January 1, 1917, has resigned to take charge of the Employee Relations Department of the International Harvester Company. He will take up his new duties immediately. Although giving up the actual direction of the Museum's work, Mr. Young will continue to be closely concerned with its affairs, for he has been elected to the vice-presidency, succeeding the late Dr. Frederic R. Hutton.

In recognition of Mr. Young's accomplishments as chief safety Expert of the Federal Government, the Museum has just awarded him the Louis Livingston Seaman medal.

Mr. Young's successor is R. M. Little, formerly a trustee of the Museum and a man thoroughly versed in work along sociological lines, having served as Chairman of the Executive Committee of the Organized Charities of Chicago and as General Secretary of the Philadelphia Society for Organizing Charity. In March, 1917, President Wilson appointed him chairman of the United States Employees' Compensation Commission, an office he held until called upon to take up active directorship of the Museum of Safety.

Chester C. Rausch, who on July 8 will come to the Museum as assistant to the director, has had a wide experience in engineering, safety and industrial work. At the time he was called to the Museum of Safety he was acting as Chief Safety Engineer of the Navy Department, Bureau of Docks and Yards, and was stationed at Washington.

Mr. Little is a graduate of the Pittsburgh Divinity School and the University of Chicago. Mr. Rausch is a graduate of the Boston Mechanics Art School and the Massachusetts Institute of Technology.

DISTRIBUTION OF GOVERNMENT WORK

In order to provide for an equitable distribution of Government work, the War Industries Board has divided the entire country into twenty industrial regions, each one of which is presided over by a Regional Committee known as the War Resources Committee.

Regional District Number 3 includes the territory extending from the northerly limits of Columbia and Greene Counties in New York State to as far south as Mercer and Ocean Counties in New Jersey.

In this Region the Trade Committee on Non-Ferrous Castings has been organized with Thomas H. Williams, president of E. A. Williams & Son, Inc., Jersey City, N. J., as Chairman.

For simplicity the Non-Ferrous Casting Committee in the Third Region has divided it into sub-districts with a vice-chairman in charge of each district. These vice-chairmen, together with Mr. Williams, make up the General Regional Committee on Non-Ferrous Castings.

The sub-chairmen and their respective districts are as follows:

W. E. Paulson of Thomas Paulson & Son, Inc., Brooklyn, N. Y.—Brooklyn and Manhattan south of 14th Street.

J. Bayard Kirkpatrick of The Neptune Meter Company, Long Island City, N. Y.—Queens and Manhattan north of 14th Street.

Mr. L. C. Dodd of the Magnus Company, Jersey City, N. J.—Staten Island, Bayonne, Hoboken, Jersey City, and the rest of Hudson County (not including any of Newark or Arlington.)

A. D. Hobbie of F. H. Lovell & Company, Arlington, N. J.—Arlington, Bergen County, Morris County, Passaic County, Sussex County, Warren County, Bloomfield.

W. D. Goldsmith of C. A. Goldsmith, Newark, N. J.—Newark, Essex County (excepting Bloomfield) Hunterdon County, Somerset County and Union County.

Not yet appointed.—All of New York in Third Region not included in the above sub-districts.

PRINTED MATTER

Women in War Time.—Wartime Employment of Women in Metal Trades is most interestingly described in Research Report Number 8, consisting of eighty pages published by the National Industrial Conference Board of Boston, Mass.

Metals, Minerals and Chemicals.—A. D. Mackay, 130 Pearl Street, New York, N. Y., has issued bulletins giving a list of the minerals he has in stock and also of various products that he is especially interested in obtaining. These lists may be had upon application.

Brass Foundry Suggestions, Polishing and Buffing Lathes and Stevens Generators are the titles of three recent catalogs issued by Frederic B. Stevens, Detroit, Mich. These catalogs give full information and illustrations relating to practically everything the brass foundryman and metal finisher could possibly need for operating their plants. Copies may be had upon request.

Safe Practices.—Two Bulletins have been issued by the National Safety Council, one being devoted to Grinding Wheels and Their Operations and the other, Scaffolds for Industrial Plant Use. Very valuable information is contained in these bulletins with particular reference to safety for life and limb. Copies may be had by corresponding with W. H. Cameron, care of the National Safety Council, Chicago, Ill.

Accident Report.—The Industrial Hospital of the Scovill Manufacturing Company, Waterbury, Conn., has issued a most interesting Accident Report for 1917. The report consists of twenty pages and gives complete accounts of all the accidents occurring in the Scovill Manufacturing Company's plants for last year. There are included some fine half tone engravings of the quarters and of the work of the hospital staff of the Company. Not the least interesting part of the report is the detailed chart showing a comparative statement of accidents so arranged as to tabulate the parts of the body and the character of the injuries sustained.

Fuel Facts.—The United States Fuel Administration published, under date of August 1st, a very interesting booklet concerning the fuel problem in the United States. This booklet, which contains sixty-four pages, gives full information relating to the regulations concerning the use of fuel for all purposes. There are also instructions for the most economical use of fuel of various kinds including the regulation of temperature in houses and factories. There is also a summary giving the production of coal and oil of various countries. Copies may be had on application to the Educational Bureau, United States Fuel Administration, Washington, D. C.

Pyrometry.—The Potentiometer System of Pyrometry and Temperature Control is the title of a 60-page, 8 x 10½ in. catalog, published by the Leeds & Northrup Company, of Philadelphia, Pa., to describe a system of pyrometry and temperature control in which the potentiometer method is employed for measuring the electromotive force of thermocouples. A known electromotive force is included in the circuit with the thermocouple and by varying the known electromotive force, the current can be varied until a galvanometer, also in the circuit, indicates that no current is flowing. When this has been done, the thermocouple electromotive force is, of course, equal to the known electromotive force.

Condensers, Pumps, Cooling Towers, Etc., is the name of Bulletin 112-A just published by the Wheeler Condenser & Engineering Company, Carteret, New Jersey. Readers contemplating the installation of a condenser will be interested in a discussion in this bulletin entitled "Choice of Kind of Condenser" and in the remainder of the bulletin which illustrates and describes other Wheeler condensing machinery in detail. The bulletin embraces large and small surface condensers showing typical complete installations; rectangular and cylindrical types; jet condensers; barometric condensers; Wheeler Edwards air pumps; Wheeler rotative dry vacuum pumps; the Wheeler turbo air pump; centrifugal pumps for circulating water; natural and forced draft cooling towers. In addition, a page is devoted to the Wheeler feed water heater and two pages to Wheeler multiple effect evaporators and dryers.

Mines Handbook.—This work, which is an enlargement of the Copper Handbook formerly published by Horace Stevens, is announced by Walter Harvey Weed, editor, as being ready for distribution. Volume 13, which is known as the International Volume, is stated to have descriptions of over 4,500 mining companies together with many maps of mining districts, statistics of rare and common metals, production, prices and so forth. As an addition to this work all the important foreign mines now in operation have been included. The book sells for $10, carriage prepaid, and may be obtained from W. H. Weed, editor, 29 Broadway, New York.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL STOCKS MARKET QUOTATIONS

NEW YORK, August 5, 1918.

	Par	Bid	Asked
Aluminum Company of America...	$100	500	600
American Brass	100	220	225
American Hardware Corp.....	100	124	128
Bristol Brass	25	38	41
Canadian Car & Foundry, com....	100	34	38
Canadian Car & Foundry, pfd.....	100	85	89
Eagle Lock	25	75	80
International Silver, com.....	100	35	45
International Silver, pfd.....	100	—	75
Jew Jersey Zinc.....	100	225	230
Rome Brass & Copper.....	100	300	350
Scovill Manufacturing	100	405	425
Standard Screw, com.....	100	288	295
Standard Screw, "A" pfd.....	100	103	—
Yale & Towne Mfg. Co.....	100	200	210

Corrected by J. K. Rice, Jr., & Co., 36 Wall street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

SEPTEMBER 9, 1918.

COPPER.

The 26c. per lb. maximum price for copper established in July, to be effective until August 15, was continued to November 1 at the conference August 7, notwithstanding confident expectation in the trade that an advance would be made. All shipments to be made after November 1 will be subject to any revision made by the price fixing committee to take effect after that date. In regard to contracts placed at 23.50c. per pound, the trade was informed that with the change made July 2, all such contracts were automatically increased to 26c. per pound, if shipment had not been made prior to that date.

A large buying movement set in as soon as the settlement of the price was announced. Owing to shortage of labor and extreme heat, production of both crude and refined copper was reduced in July but enough metal for all essential industries is assured for the time being.

Exports in July were 27,963 tons—Canada not included—of which only 7,963 tons went from other ports than New York. In first seven months 1918, total exports—Canadian figures for June and July not available—were 214,237 tons as compared with 299,000 tons for corresponding period 1917.

TIN.

The tin market throughout August remained more or less inactive, the trade awaiting announcement of the result of conferences now going on between representatives of this Government and authorities in Great Britain, which it was confidently expected would remove some of the difficulties experienced in buying tin. Prices gradually receded and for the first time since Dec. 11, 1917, quotations on spot Straits metal appeared—90c per pound, an increase of 4c over the last previous figure,—being given Aug. 20—for wholesale lots. On Aug. 26, however, they were again suspended. One small lot of spot for shipment from another city was later offered at 88c. Tin for importation from the Straits, at the close of the month, was estimated around 77c. Other grades for prompt delivery ranged 82-83c per pound.

New York port arrivals in August were 2,500 tons. Pacific arrivals were 3,535 tons, making a total of 6,035 tons. Total at both ports for first eight months amounted to 41,911 tons. Deliveries for first seven months 1918 were 8,134 Atlantic ports, 28,109 Pacific ports.

LEAD.

Acute scarcity of metal and heavy demand for lead continued throughout August with prices fixed by agreement of producers in July, unchanged at 8.05c New York, 7.75c E. St. Louis in both the outside market and the "Trust." Jobbers' prices ex store, New York, advanced to 8.55c per pound. Lead ore was strong throughout the month at $100 per ton.

Production for first half 1918, exclusive of antimonial metal, was 266,874 tons, compared with 563,000 tons for all of 1917, or about 15,000 tons less, on the average for six months. The lead Producers' Committee issued strict regulations to the trade, pointing out the necessity for earnest co-operation in order to conserve supplies for Government war needs which are very heavy. July exports of lead reported amounted to 4,893 tons.

SPELTER.

With renewed activity and Government buying in the spelter market in August, the July decline in prices was quickly recovered, the advance continuing to the highest level of this year—9.60@9.72½c New York, 9.25@9.37½c E. St. Louis, by the 26th, after which, due to slackend demand, there was a recession to 9.55c New York, 9.20c E. St. Louis. Brass special for which there is no demand, was held at 9.50c. High grade ore, by agreement of operators and producers, continued to be sold at $75 per ton; other grades, after declining to $40@45 per ton early in the month, advanced to $50@55 per ton.

Production of spelter, owing to war demands, increased from 346,000 tons in 1914 to 668,000 tons in 1917. The weekly statistics issued by the Government indicate shrinkage in stocks of prime Western and brass special. Both grades have been redistilled into grade A recently, to such an extent as to produce an excess over demand for the latter. July exports reported amounted to 5,497 tons.

ALUMINUM.

The aluminum price fixed last June—33c per pound, f. o. b. producing plants in U. S. for ingots 98@99%—to be effective until Sept. 1, was continued by the War Industries Board and approval of the President, until March 1, 1919. Enormous war requirements continue to absorb production, notwithstanding efforts to increase it.

Output in 1918, it is estimated, will prove record-breaking, 270,000,000 pounds being expected, which is an increase of 35% over production in 1917.

ANTIMONY.

The antimony market in August was active and firm prices advancing 1⅜c per pound from 13.00@13.25c duty paid for prompt and August shipment early in the month to 14.37½@14.62½c by the 22nd. A recession, due to falling off in demand, occurred in the closing days to 14.12½c duty paid, making the net advance only ¾c per pound. An unusual feature was the rapid advance in price of future positions from the Orient, c. i. f., New York, due to Japanese Government buying, and which caused a rise from 12c at the beginning of the month to 14c, but buyers in this market were not attracted as the equivalent was much higher than metal could be obtained at home.

SILVER.

Announcement was made on August 15, that the United States Government had fixed the maximum price of silver at $1.01⅛c per fine ounce and that export licenses would be granted by the Federal Reserve Board only for essential civil or military purposes, on condition that the purchaser would not resell beyond the maximum paid. This establishes practically a world wide market price for silver, as the United States furnishes most of the supply produced at the present time, and which is unequal to the demand.

Total exports for first seven months 1918 were $135,000,000 compared with $44,000,000 for same period of 1917. Importations for first seven months were $40,000,000, as compared with $22,000,000 in 1917.

QUICKSILVER.

About 40% of the entire production of quicksilver, estimated at 36,000 flasks of 75 lbs. each, is bought by the Government for wartime uses in making anti-fouling paint for protection of ship bottoms, for medicinal purposes and also for ammunition.

The Government pays $105 per flask for pure quicksilver and $100 per flask for recoveries or secondary metal. The maximum base in the outside market is $135 per flask of 75 lbs. The price paid in August was $125 per flask in lots of 100 flasks or in smaller lots.

PLATINUM.

The United States Government continues to absorb all supplies of platinum outside of regulated amounts to essential industries at the fixed price of $105 per ounce.

OLD METALS.

Old metals in August continued in excellent demand with price advances ranging from ¼c per lb. to 1½c. Light copper was up 1c per lb. to 21c; uncrucibled copper wire was off ½c to 22.50c; No. 1 composition turnings advanced ½c to 20.50c; new aluminum was up 1c per lb. to 30c; heavy lead advanced ⅜c to 7.50c, while tea lead advanced ¼c to 6c; old zinc scrap gained 1¼c per lb. to 6.75c. Other items on the list were unchanged.

WATERBURY AVERAGE

Lake Copper. Average for 1917—30.97. 1918—January, 23.50. February, 23.50. March, 23.50. April, 23.50. May, 23.50. June, 23.50. July, 26.00. August, 26.00.

Brass Mill Spelter. Average for 1917—11.116. 1918—January, 9.60. February, 9.60. March, 9.40. April, 8.50. May, 8.95. June, 9.50. July, 10.30. August, 10.45.

AUGUST MOVEMENT IN METALS

	Highest	Lowest	Average
Copper:			
Lake	*26.00	*26.00	*26.00
Electrolytic	*26.00	*26.00	*26.00
Casting	*26.00	*26.00	*26.00
Tin	Market strictly nominal; 90.00c quoted on Aug. 20-21-22-23		
Lead	8.05	8.05	8.05
Spelter (brass special)	9.50	8.25	8.935
Antimony	14.62½	13.00	13.812
Aluminum	†33.10	†33.10	†33.10
Quicksilver (per flask)	$130.00	$125.00	$126.932
Silver (cts. per oz.)	101½	99⅝	100.236

* Government price. † Government price for carload lots.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

Metal Prices, September 9, 1918

NEW METALS

COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.

Electrolytic, carload lots, nom.	Government price.	26
Lake, carload lots, nominal...		
Casting, carload lots, nominal		26

TIN—Duty Free.

Straits of Malacca, carload lots	none offered

LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots 8.05

SPELTER—Duty 15%.

Brass Special	9.50
Prime Western, carload lots	9.50

ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.

Small lots, f. o. b. factory	....
100-lb., f. o. b. factory	....
Ton lots, f. o. b. factory.....Government price.	33.20

ANTIMONY—Duty 10%.

Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	14

NICKEL—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem.

Shot or Ingots	40 to 45c.

ELECTROLYTIC—5 cents per pound extra.

MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$2.00
BISMUTH—Duty free	3.50
CADIUM—Duty free	nominal 1.75
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	3.00
QUICKSILVER—Duty 10% per flask of 75 pounds	$125.00
PLATINUM—Duty free, per ounce	105.00
SILVER—Government assay—Duty free, per ounce	1.01⅛
GOLD—Duty free, per ounce	20.67

INGOT METALS

Silicon Copper, 10%	according to quantity	50 to55
Silicon Copper, 20%	" "	50 to55
Phosphor Copper, guaranteed 15%	" "	57 to62
Phosphor Copper, guaranteed 10%	" "	55 to60
Manganese Copper, 30%, 2% Iron	" "	65 to72
Phosphor Tin, guaranteed, 5%	" "	1.25 to1.30
Phosphor Tin, no guarantee	" "	1.10 to1.15
Brass Ingot, Yellow	" "	18½to20½
Brass Ingot, Red	" "	27 to29
Bronze Ingot	" "	26 to27
Parsons Manganese Bronze Ingots	" "	30½to32
Manganese Bronze Castings	" "	40 to50
Manganese Bronze Ingots	" "	26 to30
Phosphor Bronze	" "	24 to30
Casting Aluminum Alloys	" "	38 to39

OLD METALS

Buying Prices.		Selling Prices.
24.00	Heavy Cut Copper	25.50
23.00	Copper Wire	25.00
21.00	Light Copper	23.00
23.00	Heavy Mach. Comp	25.50
14.50	Heavy Brass	16.50
11.00	Light Brass	13.50
14.25	No. 1 Yellow Brass Turning	14.25
21.50 to 22.50	No. 1 Comp. Turnings	23.00 to 25.00
7.00	Heavy Lead	7.25
5.25	Zinc Scrap	5.70
10.00 to 13.00	Scrap Aluminum Turnings	11.00 to 14.00
19.00 to 21.50	Scrap Aluminum, cast alloyed	21.00 to 23.00
26.00 to 28.00	Scrap Aluminum, sheet (new)	28.00 to 30.00
55.00	No. 1 Pewter	60.00
22.00 to 23.00	Old Nickel anodes	25.00 to 26.00
30.00 to 32.00	Old Nickel	34.00 to 36.00

PRICES OF COPPER SHEET

Mill shipments (hot rolled) ..... 38c. base net
From stock ..... 40c. base net

The following table shows the advance in cents per pound over the base price of copper sheet of various grades, lengths and widths.

SIZE OF SHEETS. Width.	LENGTH.	CENTS PER LB. 64 oz. and over.	32 oz. to 64 oz.	24 oz. to 32 oz.	16 oz. to 24 oz.	CENTS PER LB. OVER BASE. 15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not Wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							
	Longer than 120 ins.	5	8							
Wider than 120 ins., but not wider than 132 ins.	Not longer than 132 ins.	6	9							
	Longer than 132 ins.	7								
Wider than 132 ins.		8								

Width.	LENGTH.	Light than 8 oz.	8 oz.	9 oz.	10 oz.
Not wider than 30 ins.	Not longer than 72 inches.	9			3
	Longer than 72 inches. Not longer than 96 inches.		6	4½	6
	Longer than 96 inches. Not longer than 120 inches.		9	7½	
Wider than 30 ins., but not wider than 36 ins.	Not longer than 72 inches.				
	Longer than 72 inches. Not longer than 96 inches.				
Wider than 36 ins., but not wider than 48 ins.	Not longer than 72 inches.				

[The insert shows the extras on copper sheets from 10, 9, 8 and less than 8 oz. in weight, and various lengths and widths.]

The longest dimension in any sheet shall be considered as its length.

Metal Prices, September 9, 1918

Extras for Copper Sheets.

Circles, 8 in. diameter and larger, segments and pattern sheets, advance per pound over prices of sheet copper required to cut them from..... 3c.

Circles less than 8 in. in diameter, advance per pound over prices of sheet copper required to cut them from..... 2c.

Cold or hard rolled copper, 14 oz. per square foot and heavier, advance per pound over foregoing prices..... 1c.

Cold or hard rolled copper, lighter than 14 oz. per square foot, advance per pound over foregoing prices..... 2c.

Cold rolled annealed copper, the same price as cold rolled copper.

All polished copper, 20 in. wide and under, advance per square foot over the price of cold rolled copper..... 1c.

All polished copper, over 20 in. wide, advance per square foot over the price of cold rolled copper..... 2c.

For polishing both sides, double the above price.

The polishing extra for circles and segments to be charged on the full size of the sheet from which they are cut.

Cold rolled copper, prepared suitable for polishing, same prices and extras as polished copper.

All planished copper, advance per square foot over the prices for polished copper ..... 1c.

Tinning.

Tinning sheets on one side, all sizes, per square foot.... 5c.

For tinning both sides double the above price.

Extra for tinning or polishing circles and segments, to be charged on the full size of the sheet from which they are cut.

For tinning edges of sheets, one or both sides, prices shall be the same as for tinning all of one side of the specified sheet.

Oval Copper Bottoms.

Tinned One Side.

16 oz. to square foot and heavier, per pound.....Base
15 oz. to square foot per lb., advance over base..... ½c.
14 " " " " " " " " " .....1c.
13 " " " " " " " " " .....1½c.
12 " " " " " " " " " .....2c.
11 " " " " " " " " " .....3c.
10 " " " " " " " " " .....4c.
Lighter than 10 oz. to square foot, per pound .....7c.

Round copper bottoms, tinned one side, 8 in. (203.2) diameter to 17 in. (431.8) diameter, both inclusive, 1c. per lb. advance over ovals.

Copper circles, tinned one side, less than 8 in. (203.2) diameter, 3c. per lb. additional.

Copper circles, tinned one side, over 17 in. (431.8) diameter, not classed as copper bottoms.

Polished oval and round tinned copper bottoms, same advance as for sheets.

Copper Anodes or Battery Plates Not Larger Than 20 x 30.
⅜ in. (9.5) and thicker, untrimmed..... lb.
⅜ in (9.5) and thicker, trimmed to size..... lb.

If drilled, full weight before drilling to be charged.

Nickel-Plated Copper.

Net Cash Prices.

Sheets 14 x 48 (355.6 x 1219.2) inches.

	Advance over base per lb.	Plating per sheet
14 and 16 oz. and heavier, by the case of 500 pounds and over.....	6c.	40c.
14 and 16 oz. and heavier, less than one case	7c.	42c.
12 oz. and lighter, by the case.....	8c.	40c.
12 oz. and lighter, less than one case.....	9c.	42c.

Boiler Sizes.

Over 12 (.40) Oz.

By the case of 500 lbs., 7 in (177.8) (14 x 52) (355.6 x 1320.8) ..... 6c. 45c.
By the case of 500 lbs., 8 in. (203.2) (14 x 56) (355.6 x 1422.4) ..... 6c. 45c.
By the case of 500 lbs., 9 in. (227.6) (14 x 60) (355.6 x 1523.6) ..... 6c. 50c.

For less quantity than one case, add 2c. per lb.; 12 oz. and lighter, add 3c. per lb.

Tinning.

For copper nickel plated on one side and tinned on the other, add for
All sizes, per square foot.....3½c.

Note.—The figures in heavy face type in all cases represent metric measurements.

BARE COPPER WIRE—CARLOAD LOTS

29c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order.....45c. per lb. base
100 lbs. to 300 lbs. in one order.....46c. " " "
Less than 100 lbs. in one order.....47½c. " " "

SEAMLESS COPPER TUBING

41 to 44c. per lb. base.

BRASS MATERIAL—MILL SHIPMENTS

In effect July 3, 1918.

To customers who buy 5,000 lbs. or more per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.30	$0.33	$0.36
Wire	.30	.34	.37
Rod	.28	.34	.37
Brazed tubing	.38	..	.44
Open seam tubing	.38	..	.44
Angles and channels	.43	..	.48

To customers who buy less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.31½	$0.35	$0.38
Wire	.31½	.36	.39
Rod	.30	.36	.39
Brazed tubing	.40	..	.46
Open seam tubing	.40	..	.46
Angles and channels	.45	..	.50

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

SEAMLESS BRASS TUBING

37½ to 40½c. base.

SEAMLESS BRASS TUBING—IRON PIPE SIZES

37½ to 40½c. base.

IRON LINED TUBING—NOT POLISHED

Due to fluctuations of the metal market we are unable to quote these prices.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod.....35½c. net base
Muntz or Yellow Metal Sheathing (14" x 48").32c. " "
Muntz or Yellow Metal Rectangular sheets other than Sheathing.....35c. " "
Muntz or Yellow Metal Rod.....33c. " "
Above are for 100 lbs. or more in one order.

Metal Prices, September 9, 1918

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 15c. basis, less 8%

Casks, jobbers' prices....17c.

Open casks, jobbers' prices....17½c.

The above mill prices have been fixed by the United States Government, applying to civilian population of the United States and allied governments.

ALUMINUM SHEET, ROD AND WIRE

Sheet Aluminum, outside market contract base price, 42.40c. per pound.

FLAT SHEET

Gauge		Price in Cents per Lb. 1 Ton Lots	15 Ton Lots	50 Ton Lots
Nos. 18 and heavier	3" to 60"	42.40	42.20	42.00
Nos. 19 and 20	3" to 60"	43.50	43.30	43.10
Nos. 21 to 24, incl.	3" to 30"	45.80	45.60	45.40
	30" to 48"	48.00	47.80	47.60
	48" to 60"	51.40	51.20	51.00
Nos. 25 and 26	3" to 30"	49.20	49.00	48.80
	30" to 48"	51.40	51.20	51,00
No. 27	3" to 30"	50.30	50.10	49.90
	30" to 48"	53.70	53.50	53.30
No. 28	3" to 30"	52.50	52.30	52.10
	30" to 48"	55.90	55.70	55.50
No. 29	3" to 30"	55.90	55.70	55.50
	30" to 48"	60.40	60.20	60.00
No. 30	3" to 30"	58.20	58.00	57.80

ROD.

B. & S. Gauge.
¼" to 1" Advancing by 32nds
1" to 2⅝" " " 16ths } 98% rolled, 43.10 cents per lb.
2⅝" to 3½" " " 8ths

⅜" to ¾", 98% rolled and drawn....48.80 cents per lb.

WIRE.

Definition: Round—less than ⅜" diameter. Other shapes—less than ⅛" greatest diameter.

B. & S. Gauge.	Spools.	Price in Cents Per Lb. On Spools.	In Coils.
Nos. 2 to 10, inclusive	50 lb.	$.465	$.437
Nos. 11 and 12	50 lb.	.499	.465
Nos. 13 and 14	35 lb.	.533	.493
Nos. 15 and 16	20 lb.	.611	.549
Nos. 17 and 18	20 lb.	.689	.606
Nos. 19 and 20	10 lb.	.714	.718
No. 21	10 lb.	.815	.803
No. 22	10 lb.	1.050	.915
No. 23	10 lb.	1.185	1.028
No. 24	5 or 2 lb.	1.421	....
No. 25	5 or 2 lb.	1.646	....
No. 26	5 or 2 lb.	1.928	....
No. 27	1 lb.	2.321	....
No. 28	1 lb.	2.771	....
No. 29	½ lb.	3.840	....
No. 30	½ lb.	5.021	....

GRADE "B" NICKEL SILVER SHEET METAL

Quality.	Net per lb.	Quality.	Net per lb.
5%	42½c.	16%	47c.
8%	43½c.	18%	47½c.
10%	43¾c.	20%	49¼c.
12%	45½c.	25%	57c.
15%	49c.	30%	62½c.

NICKEL SILVER WIRE

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	15%	52c.
8%	46c.	16%	52½c.
10%	48c.	18%	54½c.
12%	50c.	30%	70c.

The above Base Prices are subject to additions for extras as per list printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are correspondingly higher.

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over at N. Y. tin price, 100 lbs. or more, 5c. over Pig Tin. 50 to 100 lbs., 12c. over, 25 to 50 lbs., 15c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—5.75 cents per lb.

TIN FOIL

Base price—No quotation.

PLATERS METALS

Platers' bar in the rough, 65c. net.

Nickel silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from $1.03 to $1.05 per Troy ounce, depending upon quantity.

NICKEL ANODES

85 to 87% purity	.55c.	per lb.
90 to 92% "	.57½c.	" "
95 to 97% "	.60c.	" "

Supply Prices, September 9, 1918

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg.	lb.	.08
Hydrochloric, C. P., 22 deg.	lb.	.16
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg.	lb.	—
Nitric, 42 deg.	lb.	—
Sulphuric, 66 deg.	lb.	.08
Alcohol—		
Denatured	gal.	1.00
Alum—		
Lump	lb.	—
Powdered	lb.	—
Aluminum sulphate, iron free	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Arsenic, white	lb.	.25
Argols, white, see Cream of Tartar	lb.	.80
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.15
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	—
Carbonate	lb.	.45
Cyanide	lb.	.65
Sulphate	lb.	.15
Copperas (Iron Sulphate)	lb.	.06
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.80
Crocus	lb.	.10
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	12.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.06
Lead Acetate (Sugar of Lead)	lb.	—
Yellow Oxide (Litharge)	lb.	.20
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate Dry	lb.	.80
Chloride	lb.	.70
Salts, single bbl.	lb.	.16
Salts, double bbl.	lb.	.14
Paraffin	lb.	.25
Phosphorus—Duty free, according to quality		75-100
Potash, Caustic (Potassium Hydrate)	lb.	—
Lump	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 96-98%	lb.	1.25
Cyanide, 98-99½%	lb.	—
Sulphocyanide	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	.73⅝
Rosin	lb.	.10
Rouge, nickel	lb.	.45
Silver and gold	lb.	.60
Sal Ammoniac (Ammonium Chloride)	lb.	.30
Sal Soda	lb.	.05
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.6778
Soda Ash, 58%	lb.	.08
Sodium—		
Biborate, see Borax	lb.	.15
Bisulphite	lb.	.15
Cyanide	lb.	.30
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.12
Phosphate	lb.	.14
Silicate (Water Glass)	lb.	.05
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.35
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate	lb.	—
Water Glass, see Sodium Silicate	lb.	.05
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.35
Cyanide	lb.	.50
Sulphate	lb.	.12

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$70.20
14 " 20 " 64/68 "	"	92.50
12 " 20 " 84/92 "	"	83.55
14 " 20 " 84/92 "	"	108.35
Sewed buffs per pound.		
Bleached and unbleached	"	.60
Colored	"	.55

FELT WHEELS

Diameter	Thickness	Price
White Spanish—		
6 to 20 inches, inc.	½ inch or under	$3.05 per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	2.95 "
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	2.75 "
10 to 16 inches, inc.	1 inch to 3 inches, inc.	2.65 "
18 to 20 inches, inc.	1 inch to 3 inches, inc.	2.75 "
6 to 20 inches, inc.	over 3 inches	2.75 "
Grey Mexican—		
Diameter	Thickness	Price
6 to 20 inches, inc.	½ inch or under	$2.95 per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	2.85 "
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	2.65 "
10 to 16 inches, inc.	1 inch to 3 inches, inc.	2.55 "
18 to 20 inches, inc.	1 inch to 3 inches, inc.	2.65 "
6 to 20 inches, inc.	over 3 inches	2.65 "